BUREAU OF FISHERIES

REPORT

OF THE

UNITED STATES COMMISSIONER OF FISHERIES

FOR THE FISCAL YEAR 1917

WITH

APPENDIXES

HUGH M. SMITH
Commissioner

WASHINGTON
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CONTENTS.

REPORT OF THE UNITED STATES COMMISSIONER OF FISHERIES FOR THE FISCAL YEAR ENDED JUNE 30, 1917

1

CONTENTS.

REPORT

OF THE

COMMISSIONER OF FISHERIES.

DEPARTMENT OF COMMERCE,
BUREAU OF FISHERIES,
Washington, October 4, 1917.

SIR: There is submitted herewith a report covering in outline the operations and activities of the Bureau of Fisheries during the fiscal year ended June 30, 1917.

GENERAL ADMINISTRATIVE CONSIDERATIONS.

The past fiscal year may properly be regarded as the most important and successful in the recent history of the Bureau. The service was better equipped than ever before in both material facilities and personnel; it received liberal financial support from Congress and generous criticism and appreciation from the public; it was enabled to extend and expand its activities so as to serve in a most acceptable manner a large usefulness to the fishing industry and the country at large; it was privileged to make special adaptation of its investigational and technical operations to meet the great national emergency; and at the beginning of the current fiscal year its outlook for continued and increased usefulness in all lines of activity was most promising.

The Bureau's administrative staff at headquarters at the beginning of the fiscal year consisted of H. F. Moore, Deputy Commissioner; Irving H. Dunlap, assistant in charge of office; Henry O'Malley, assistant in charge of fish culture; Robert E. Coker, assistant in charge of inquiry respecting food fishes and the fishing grounds; Alvin B. Alexander, assistant in charge of statistics and methods of fisheries; and Ward T. Bower, chief agent of the Alaska service. On October 31, 1916, the death of Mr. Alexander deprived the Bureau of an able and loyal employee, who had been in the service since 1887 and chief of division since 1903. He was succeeded by Lewis Radcliffe, who has been in the Bureau since 1907, serving for two years as director of the biological laboratory at Beaufort, N. C., and later as assistant in the division of scientific inquiry. To each of the foregoing and to the rank and file throughout the country the Commissioner extends his appreciative thanks and commends them to the Secretary for efficient and faithful service that has made the year exceptionally fruitful.

The appropriations for the Bureau of Fisheries for the fiscal year 1917 aggregated $1,144,850, as follows:

Salaries	$427,350
Miscellaneous expenses:	
Administration	10,000
Propagation of food fishes	360,000
Maintenance of vessels	80,000
Inquiry respecting food fishes	42,000
Statistical inquiry	7,500
Protecting sponge fisheries	3,000
Protecting seal and salmon fisheries of Alaska	75,000
Investigating damages to fishes	25,000
Completion of and improvements at stations:	
Gloucester, Mass	3,000
Duluth, Minn	2,000
Key West, Fla	25,000
Lobster-rearing plant	5,000
Two steel distribution cars	40,000
Two motor boats, Alaska service	10,000
Buildings and improvements, Pribilof Islands, Alaska	20,000
Repairs, steamer *Albatross* (deficiency)	10,000

A detailed report of the expenditures under each of these appropriations will be submitted in accordance with law.

THE COMMERCIAL FISHERIES.

OUTLINE OF ACTIVITIES.

The activities of the Bureau in relation to the commercial fisheries, over which it should be understood the Government exercises no jurisdiction or supervision except in Alaska, have included the following subjects during the fiscal year 1917: Canvass of the entire fishing industry of the Pacific States; canvass of the shrimp industry of the South Atlantic and Gulf States; collection of detailed statistics of the vessel fisheries centering at Boston and Gloucester, Mass., Portland, Me., and Seattle, Wash., and the publication of this information for the use of the trade in monthly and annual one-sheet bulletins; practical studies of the methods of preparing fishery products for food, fertilizer, and other purposes; prosecution of an active campaign for the more extensive production, distribution, and utilization of fish for food, particularly certain species that have heretofore entered into the food supply only to a limited extent; demonstrations and investigations addressed to the proper and more complete utilization of waste products of the fisheries; practical assistance to the fishermen through demonstration of new or improved methods of handling and preparing their catch; aid in establishing and promoting a hydroid fishery in United States waters; investigations of new aquatic sources of leather, and conduct of active work in the interests of fishermen and tanners looking to the use of skins of various fishes and other water animals in manufacturing leather; and the dissemination among fishermen and fish packers of a very large amount of descriptive matter on the preservation and utilization of fishery products.

SHRIMP INDUSTRY OF THE SOUTH ATLANTIC AND GULF STATES.

One of the most important fisheries of the South Atlantic and Gulf States is that for shrimp. The Bureau has recently completed a canvass of this industry for 1916, which reveals a surprising growth

as compared with previous canvasses. The aggregate catch in that year was 43,942,105 pounds with a value of $758,620, an increase of 136.7 per cent in quantity and 72.9 per cent in value over the last canvass, that of the Bureau of the Census for 1908. Louisiana still remains the center of the industry, over 41 per cent of the entire catch, or 18,160,586 pounds, being accredited to it; Florida is second with 11,549,175 pounds; Mississippi third with 8,899,350 pounds; and Georgia fourth with 4,261,480 pounds. The remaining States of North Carolina, Texas, South Carolina, and Alabama ranking in the order named, produced less than 2.5 per cent of the entire catch.

The number of persons engaged in the industry was 9,235, of whom 3,645 were fishermen, 89 on transporting vessels, and 5,501 in the shore industries. The investment in boats, fishing apparatus, shore and accessory property, and cash capital aggregated $2,484,625, and the wages paid in the canning and drying industries amounted to $246,775. The cost of cans, paper linings, labels, and cases for canned shrimp was $331,162. The wholesale trade in raw, dry-cooked, and pickled shrimp totaled 5,780,090 pounds, valued at $430,123.

Three marine species of shrimp are taken for commercial purposes. Of these the most important and abundant form is *Penæus setiferus*, which occurs throughout the range of the fishery from Beaufort, N. C., to Corpus Christi, Tex. The closely related species *P. brasiliensis* is much less abundant and may be distinguished from the other by the character of the groove along each side of the rostrum which extends nearly to the posterior margin of the carapace, while in *P. setiferus* this groove extends less than halfway back. As the fishermen do not recognize these differences, an estimate of the relative importance of *P. brasiliensis* is difficult. The third species, *Xiphopeneus kroyeri*, commonly known to the fishermen as "sea-bobs" or "seven-beards," is considerably smaller, differs in color and general appearance, and has a rostrum as long as or longer than the carapace instead of shorter, as in the species of *Penæus*. It is taken commercially only on the Louisiana coast, where it is used solely for drying when the larger species are unobtainable.

On the Atlantic coast the bulk of the shrimp are taken with otter trawls and on the Gulf coast with haul seines, except in Texas where cast nets are used almost exclusively. At Apalachicola, Fla., and Biloxi, Miss., the otter trawl has recently been introduced and is expected to play an increasingly important part in the shrimp fishery of the Gulf coast. In the trawl fishery, motor boats with crews of one to three men are employed. In the Mississippi haul-seine fishery, sail schooners about 40 feet in length serve to carry the fishermen to the fishing grounds, 25 to 80 miles distant, and the catch to the factory. In operating the seine a motor boat and a rowboat are used. The seines range from 175 to 250 fathoms in length and 11 to 18 feet in depth and are operated by crews of 6 men. In Louisiana, the fishermen establish camps near the fishing grounds, the latter being visited in open motor boats. The haul seines employed in this State average about 300 fathoms in length. Gasoline luggers make frequent trips to the fishing grounds to transport the catch to the canning factories, most of which are located in New Orleans.

The irregularity of the movements of the shrimps makes it difficult to define the seasons of abundance in the various waters. In general,

the season in North Carolina is August to November; in South Carolina July to November; in Georgia and east Florida the year round, with irregular slack periods; in west Florida October to July; in Mississippi March, April, and July to December; in Louisiana February to May and July to November; in Galveston Bay, Tex., March to November; and in Corpus Christi Bay, Tex., throughout the year with longer or shorter periods of slackness. The introduction of the otter trawl in Mississippi may lengthen the season in that State.

In 1916, 448,443 cases of canned shrimp, with a value of $1,436,851 were produced. The principal canning center is Biloxi, Miss., at which place not less than 13 plants are operated. New Orleans is second in importance. Shrimp were also canned at Houma, La.; Lakeshore, Bay St. Louis, Pass Christian, and Ocean Springs, Miss.; Apalachicola, Fernandina, and Nassauville, Fla.; Valona and Brunswick, Ga.; and Southport, N. C.

The canning operations are quite simple. The meat is separated by hand from the heads and shells, thoroughly washed in fresh water, and cooked in wooden tanks for 5 to 10 minutes in boiling water to which sufficient salt for seasoning has been added. The meat is then spread on wire-meshed trays to cool and is then packed in the cans by hand. The cans are of two sizes, holding about 4 and 8 ounces of meat, respectively. For the dry pack, the cans are lined with parchment paper cut to size by the dealer supplying it. The paper prevents the discoloration which results when the meat is in direct contact with the tin. In the wet pack most operators have abandoned the use of the lining without unfavorable results. For this pack the cans are filled with brine. After capping, the cans are processed in steam-tight retorts at 240° F., the smaller cans for 8 to 10 minutes and the larger cans for 12 to 14 minutes; the dry-pack cans for 60 to 70 minutes.

The drying of shrimp is an important industry in Louisiana, fully half the catch being preserved in this manner. Most of the drying is done along the shores of Barataria and Timbalier Bays. Without removing heads or shells, the shrimp are boiled for about 30 minutes in large kettles of water to which salt has been added in the proportion of 10 to 20 quarts, depending on weather conditions, for each 900 pounds of shrimps. They are then spread on large wooden drying platforms at a depth not to exceed 2 to 3 inches and dried in the sun, being turned over every 20 or 30 minutes. Under favorable weather conditions, the drying is completed in 1 or 2 days. The shrimp are then pushed into circular piles and the meat threshed out by workmen walking round and round over them. This primitive method of freeing meat from heads and shells is termed "dancing the shrimp." The meat is then separated from the shells by sifting and packed in barrels for shipment. The product is sold for food in Cuba, Central and South America, and in a number of large cities in the United States. The heads and shells which have been more or less pulverized into a meal or bran by the dancing process are sacked and sold for fertilizer. In 1916, this industry yielded 1,368,346 pounds of dried shrimp, valued at $183,144 and 684 tons of fertilizer valued at $12,067. Statistics of the industry in detail are given in the following table:

SHRIMP INDUSTRY OF THE SOUTH ATLANTIC AND GULF STATES, 1916.

Items.	North Carolina, South Carolina, and Georgia.[a]		Florida.		Alabama and Mississippi.[b]		Louisiana.		Texas.		Total.	
	Number.	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
Persons engaged:												
On vessels fishing	31		24		[c] 751		5				811	
On vessels transporting					40		49				89	
In shore or boat fisheries	359		502		116		1,629		228		2,834	
In canning industry	700		691		2,450		1,547				5,388	
In drying industry							113				113	
Total	1,090		1,217		3,357		3,343		228		9,235	
Wages paid:												
In canning industry		$33,866		$48,058		$80,663		$65,538				$228,125
In drying industry								18,650				18,650
Total		33,866		48,058		80,663		84,188				246,775
Cost of cans, paper linings, labels, and cases for canned shrimp		42,946		76,206		134,296		77,714				331,162
Plants:												
Canning	6		5		16		8				35	
Drying							[d] 11				11	
Total	6		5		16		19				46	
Vessels fishing	10	24,000	12	10,400	123	237,475	1	330			146	272,205
Net tonnage	86		88		1,610		8				1,792	
Outfit		7,900		9,900		94,538		200				112,538
Vessels transporting					13	30,545	17	32,490			30	63,035
Net tonnage					153		146				299	
Outfit						10,190		23,150				33,340
Gasoline boats	120	101,950	246	166,250	89	36,140	201	79,975			656	384,315
Sail and row boats	40	600			26	4,720	85	2,550	180	$3,640	331	11,510
Apparatus—Vessel fisheries:												
Haul seines					122	33,370	1	225			123	33,595
Otter trawls	21	820	24	840	4	150					49	1,810

[a] These States are considered collectively to avoid disclosure of individual business.
[b] As the catch was small and no shrimp were packed in Alabama, that State is combined with Mississippi.
[c] Includes 120 men who were also engaged a brief portion of the year in the shore or boat fisheries.
[d] This number does not include the outfits used by individual fishermen in drying their own catch.

SHRIMP INDUSTRY OF THE SOUTH ATLANTIC AND GULF STATES, 1916—Continued.

Items.	North Carolina, South Carolina, and Georgia.		Florida.		Alabama and Mississippi.		Louisiana.		Texas.		Total.	
	Number.	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
Apparatus—Shore fisheries:												
Haul seines	16	$2,450			16	$3,350	178	$38,255	8	$800	218	$44,855
Otter trawls	189	5,150	455	$14,945	84	2,475					728	22,570
Cast nets	40	240					39	150	216	1,280	295	1,670
Shore and accessory property:												
In fishery		2,260				1,100		8,425				11,785
In canning industry		98,500		63,000		269,800		317,000				748,300
In drying industry								76,600				76,600
Cash capital:												
In canning industry		76,000		120,000		270,800		174,197				640,997
In drying industry								25,500				25,500
Total		319,870		385,335		994,653		779,047		5,720		2,484,625
PRODUCTS.												
Catch of shrimp:												
Vessel fisheries—												
With haul seines ....pounds					7,426,350	130,133	14,400	216			7,440,750	130,349
With otter trawls ....do	680,200	15,770	948,295	14,452	200,000	3,000					1,828,495	33,222
Total	680,200	15,770	948,295	14,452	7,626,350	133,133	14,400	216			9,269,245	163,571
Shore fisheries—												
With haul seines ....pounds	333,945	9,323			336,250	6,391	18,100,186	233,819	3,314	165	18,773,695	249,698
With otter trawls ....do	3,931,280	88,601	10,600,880	217,666	939,750	17,900					15,471,910	324,167
With cast nets ....do	60,000	2,400					46,000	1,270	321,255	17,514	427,255	21,184
Total	4,325,225	100,324	10,600,880	217,666	1,276,000	24,291	18,146,186	235,089	324,569	17,679	34,672,860	595,049
Grand total	5,005,425	116,094	11,549,175	232,118	8,902,350	157,424	18,160,586	235,305	324,569	17,679	43,942,105	758,620
Canned shrimp:												
Wet pack—												
No. 1 cans ....cases[a]	25,981	86,544	69,913	221,148	103,984	322,515	63,271	200,793			263,149	831,000
No. 1½ cans ....do.[b]	1,613	5,553	6,586	19,778	4,517	14,617	7,343	23,870			20,059	63,818
Dry pack—												
No. 1 cans ....cases[a]	20,379	71,578	26,287	82,121	46,709	151,435	35,995	118,439			129,370	423,573
No. 1½ cans ....do.[b]	13,233	44,249	6,080	18,678	11,125	37,766	5,427	17,767			35,865	118,460
Total	61,206	207,924	108,866	341,725	166,335	526,333	112,036	360,869			448,443	1,436,851

Dried shrimp........pounds..							1,368,346	183,144			1,368,346	183,144
Fertilizer (shells and heads)........tons..							684	12,067			684	12,067
Total								195,211				195,211
Grand total		207,924		341,725		526,333		556,080				1,632,062
WHOLESALE TRADE IN RAW, DRY-COOKED, AND PICKLED SHRIMP.												
Products sold:												
Raw shrimp—												
Whole........pounds..			490,039	27,819	445,500	21,060	58,498	2,810	220,569	12,443	1,214,606	64,132
Beheaded........do....	693,393	39,414	3,557,961	273,297							4,251,354	312,711
Dry cooked—												
Whole........pounds..	104,000	8,667	42,050	4,638							146,050	13,305
Beheaded........do....	96,060	19,001									96,060	19,001
Peeled........do....	65,000	19,500									65,000	19,500
Pickled........do....	7,020	1,474									7,020	1,474
Total	965,473	88,056	4,090,050	305,754	445,500	21,060	58,498	2,810	220,569	12,443	5,780,090	430,123

[a] 48 cans to a case.

[b] 24 cans to a case.

Comparative Statistics of the Shrimp Catch of the South Atlantic and Gulf States for Various Years from 1880 to 1916.[a]

Year.	North Carolina.		South Carolina.		Georgia.		Florida.		Alabama.		Mississippi.		Louisiana.		Texas.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
1880	63,000	$4,500	630,000	$37,500	56,000	$4,000	71,750	$3,500	(b)	(b)	(b)	(b)	534,000	$41,760	637,500	$27,540	1,992,250	$118,800
1887	120,110	4,503	338,000	18,400	185,000	6,500	(b)	(b)	(b)	(b)	1,144,800	$23,646	6,809,680	96,408	254,633	7,950	8,852,223	157,407
1888	124,000	4,650	358,860	18,860	190,650	6,800	152,000	5,800	43,750	$5,000	1,092,800	22,566	6,942,700	93,452	259,333	7,950	9,164,093	165,078
1889	135,240	5,100	380,400	19,020	150,000	5,975	78,000	2,805	30,000	600	794,200	16,741	7,238,500	95,882	241,500	7,555	9,047,840	153,678
1890	144,200	5,435	371,840	18,592	162,160	6,081	65,825	2,557	(b)	(b)	613,500	12,622	6,662,050	90,519	175,800	5,670	8,195,375	141,476
1895	(b)	(b)	(b)	(b)	(b)	(b)	62,625	2,397	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)
1897	146,496	5,885	374,500	18,395	67,600	2,535	38,625	1,497	40,600	609	1,903,165	28,804	4,486,726	80,576	360,530	7,464	7,418,242	145,765
1902	84,160	2,700	369,500	12,602	344,127	8,408	3,030,134	63,218	200	12	4,423,900	58,398	7,634,720	131,715	290,815	8,566	16,177,556	285,619
1908	371,000	9,000	452,000	19,000	528,000	19,000	4,353,000	92,000	37,000	1,200	4,121,000	81,000	8,581,000	213,000	118,000	4,400	18,561,000	438,600
1916	683,945	16,323	60,000	2,400	4,261,480	97,371	11,549,175	232,118	3,000	42	8,899,350	157,382	18,160,586	235,305	324,569	17,679	43,942,105	758,620

[a] The statistics for 1908 in this table are from data published by the Bureau of the Census.

[b] Statistics not available.

NEW ENGLAND VESSEL FISHERIES.

Statistics of the vessel fisheries centering at Boston and Gloucester, Mass., and Portland, Me., have been collected during the year by the local agents and published promptly in monthly bulletins showing, by species and fishing grounds, the quantities and values of fishery products landed by American fishing vessels at these ports. Two annual bulletins also have been issued, one showing the catch by months and the other by fishing grounds.

The fleet landing fishery products at these ports in 1916 included 512 sail, steam, and gasoline screw vessels. These vessels landed at Boston 3,089 trips, aggregating 98,331,038 pounds of fish, valued at $3,702,365; at Gloucester 2,864 trips, aggregating 66,680,548 pounds, valued at $2,159,894; and at Portland 2,992 trips, aggregating 20,812,839 pounds, valued at $521,647. The total for the three ports amounted to 8,945 trips, aggregating 185,824,425 pounds of fresh and salted fish, having a value to the fishermen of $6,383,906. No comparison with previous returns can be made for Portland, as this is the first year the products landed at that port have been included in these statistics. At Boston and Gloucester, as compared with the previous year, there was a decrease of 1,291 trips and of 6,584,142 pounds in the quantity, but an increase of $1,124,342 in the value of the fish landed. The catch of cod decreased 4,489,950 pounds, haddock 2,684,498 pounds, hake 4,258,410 pounds, cusk 1,085,389 pounds, halibut 947,234 pounds, and swordfish 483,345 pounds, but all of these species increased in value except hake, which declined about 1 per cent. The mackerel catch increased 4,225,945 pounds, or 38.70 per cent in quantity, and $396,331, or 64.54 per cent in value. There was also considerable increase in the quantity and value of herring, pollock, and miscellaneous products. The catch of Newfoundland herring decreased 26,715 pounds, or less than 1 per cent, in quantity, but increased $70,275, or 27.48 per cent, in value. The catch of tilefish landed at Boston during the year amounted to 873,142 pounds, having a value of $24,295.

The following tables present in detail, by fishing grounds and by months, the products of the vessel fisheries of Boston and Gloucester, Mass., and Portland, Me., for the calendar year 1916. The weights of fresh and salted fish given in these statistics represent the fish as landed from the vessels, and the values are those received by the fishermen. The grades, or sizes, given for certain species are those recognized in the trade.

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1916, SHOWN BY FISHING GROUNDS.

Fishing grounds.	Number of trips.	Cod.											
		Large (10 pounds and over).				Market (under 10 and over 2½ pounds).				Scrod (1 to 2½ pounds).			
		Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
		Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
LANDED AT BOSTON.													
East of 66° west longitude.													
La Have Bank	18	68,223	$2,430			106,960	$2,607			9,239	$127		
Western Bank	74	427,664	19,293			657,179	21,358			35,963	917		
Quereau Bank	5	38,540	1,395			43,360	596						
Green Bank	1	20,000	1,000										
Grand Bank	5												
Burgeo Bank	2												
Off Newfoundland	4												
Cape Shore	108	412,466	19,765			477,022	13,171			116,462	1,895		
Gulf of St. Lawrence	2												
St. Anns Bank	3	40,935	1,553			73,250	2,079			9,715	129		
West of 66° west longitude.													
Browns Bank	224	1,410,321	60,110			1,617,869	45,140			179,196	2,946		
Georges Bank	489	2,094,022	104,017			2,210,856	73,365			153,723	2,636		
Cashes Bank	16	40,769	1,622			35,630	1,015			2,711	47		
Clark Bank	1	600	24			2,000	55						
Fippenies Bank	11	16,435	854			16,610	475			449	6		
Middle Bank	83	34,945	2,014			44,407	1,886			8,389	175		
Jeffreys Ledge	532	303,362	17,773			298,478	11,570			42,348	900		
Ipswich Bay	31	134,582	5,183			29,035	1,114			775	14		
South Channel	455	644,958	42,457			1,230,410	47,952			182,334	4,572		
Nantucket Shoals	98	212,806	13,560			784,098	26,965			145,545	2,403		
Off Highland Light	4	3,429	140			2,710	87			255	4		
Off Chatham	489	1,422,194	80,866			1,725,582	58,088			167,289	2,545		
Off Race Point	5												
Bay of Fundy	3	4,775	171			6,885	170						
Seal Island	6	18,055	1,174			43,860	1,560			6,955	134		
South	24												
Shore, general	396	300,730	14,325			193,772	6,297			10,569	155		
Total	3,089	7,649,811	389,726			9,599,973	315,550			1,071,917	19,605		

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QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1916, SHOWN BY FISHING GROUNDS—Continued.

Fishing grounds.	Number of trips.	Cod.											
		Large (10 pounds and over).				Market (under 10 and over 2½ pounds).				Scrod (1 to 2½ pounds).			
		Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
LANDED AT GLOUCESTER.													
East of 66° west longitude.		*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
La Have Bank	7	22,510	$532	20,385	$933	31,100	$690	10,890	$443	2,670	$21	1,290	$29
Western Bank	46	1,238,650	30,703	69,790	3,090	1,097,481	24,444	53,280	1,713	34,108	285	6,600	152
Quereau Bank	88	1,795,658	47,815	528,630	28,926	2,949,912	66,456	330,960	12,560	115,760	939	42,160	1,075
Misaine Bank	1	27,935	698			154,270	3,548			34,040	255		
Green Bank	5	15,320	415	32,345	1,566	1,665	40	6,850	306				
Grand Bank	43	362,858	9,774	1,379,226	63,242	108,034	2,926	954,742	38,841	75,640	567	94,166	2,872
St. Peters Bank	4	50,200	1,463	13,750	852	15,090	377	5,240	278				
Burgeo Bank	1			4,200	200			575	23				
Bacalieu Bank	9	144,510	3,683	226,610	10,806	3,950	166	30,245	1,277			240	5
Off Newfoundland	42			177,000	5,495								
Cape North	15	625,050	15,063	1,022,868	45,236	267,370	5,945	603,863	23,082	10,095	76	51,740	1,396
Cape Shore	33	172,840	4,718	31,040	1,703	220,970	5,037	30,475	1,382	9,910	74	9,590	317
Gulf of St. Lawrence	14	355,280	8,999	494,530	25,056	240,970	5,078	523,830	24,687	10,261	89	82,304	2,581
St. Anns Bank	8	234,835	5,134	36,130	1,773	239,770	4,166	10,280	538	15,550	139	1,225	36
The Gully	11	21,370	618	29,630	1,562	13,416	348	8,080	341	120	1		
Labrador coast	1			13,210	576								
West of 66° west longitude.													
Browns Bank	31	523,418	13,057	21,600	1,080	595,795	12,910	4,645	186	40,595	313		
Georges Bank	117	672,710	15,085	332,948	17,140	572,046	13,426	186,895	8,945	24,917	253	7,445	217
Middle Bank	17												
South Channel	4	860	23			17,275	423			960	7		
Nantucket Shoals	58	12,805	602	11,945	582	39,410	1,173	21,865	875	1,855	20	1,965	59
Off Chatham	50												
Seal Island	3	16,060	405			10,820	200			350	2		
South	1												
Shore, general	2,255	1,433,037	67,013	858	39	30,663	696	997	35	2,370	17		
Total	2,864	7,725,906	225,800	4,446,695	209,857	6,610,007	148,109	2,783,712	115,512	379,201	3,058	298,725	8,739

LANDED AT PORTLAND.													
East of 66° west longitude.													
La Have Bank	8	8,502	507	2,790	140	1,885	53	2,415	112	340	5	......	......
Western Bank	14	68,305	1,146	......	......	105,234	1,452	......	......	9,724	111	......	......
Quereau Bank	2	4,060	110	......	......	3,000	68	......	......	......	......	......	......
Green Bank	1	......	......	......	......	......	......	......	......	......	......	......	......
Grand Bank	7	22,790	520	35,290	1,499	......	......	835	33	......	......	......	......
St. Peters Bank	1	885	23	7,660	345	6,620	159	34,450	1,378	110	1	4,815	132
Bacalieu Bank	1	......	......	......	......	......	......	......	......	......	......	......	......
Cape North	2	29,910	1,458	......	......	12,500	533	......	......	......	......	......	......
Cape Shore	4	5,180	120	......	......	2,925	66	......	......	......	......	......	......
The Gully	2	......	......	......	......	......	......	......	......	......	......	......	......
West of 66° west longitude.													
Browns Bank	4	5,355	271	......	......	1,470	48	......	......	......	......	......	......
Georges Bank	13	59,009	1,654	3,460	175	26,707	649	4,865	210	710	11	......	......
Cashes Bank	46	19,985	862	......	......	23,204	626	......	......	3,905	38	......	......
Jeffreys Ledge	57	42,198	2,502	......	......	55,251	1,956	......	......	8,187	125	......	......
South Channel	21	18,068	421	......	......	62,875	995	......	......	2,893	26	......	......
Shore, general	2,806	1,156,076	62,975	2,385	124	958,852	33,635	991	45	229,499	3,595	385	12
Total	2,992	1,440,323	72,569	51,585	2,283	1,260,523	40,240	43,556	1,778	255,428	3,912	5,200	144
Grand total	8,945	16,816,040	688,095	4,498,280	212,140	17,470,503	503,899	2,827,268	117,290	1,706,546	26,575	303,925	8,883

Fishing grounds.	Haddock.								Hake.							
	Large (over 2½ pounds).				Scrod (1 to 2½ pounds).				Large (6 pounds and over).				Small (under 6 pounds).			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
LANDED AT BOSTON.																
East of 66° west longitude.	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
La Have Bank	220,050	$5,251	......	......	33,425	$491	......	......	98,093	$3,111	......	......	90,259	$1,811	......	......
Western Bank	3,190,600	100,422	......	......	817,059	20,669	......	......	8,060	192	......	......	7,531	285	......	......
Quereau Bank	......	......	......	......	......	......	......	......	......	......	......	......	5,102	227	......	......
Cape Shore	1,860,265	75,841	......	......	194,626	4,471	......	......	98,296	4,034	......	......	190,447	5,093	......	......
St. Anns Bank	73,400	3,095	......	......	13,220	275	......	......	......	......	......	......	400	16	......	......

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1916, SHOWN BY FISHING GROUNDS—Continued.

Fishing grounds.	Haddock.								Hake.							
	Large (over 2½ pounds).				Scrod (1 to 2½ pounds).				Large (6 pounds and over).				Small (under 6 pounds).			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
LANDED AT BOSTON—continued.																
West of 66° west longitude.																
Browns Bank	6,409,925	$203,690			921,856	$17,017			199,009	$8,168			201,286	$4,942		
Georges Bank	3,753,608	138,341			1,787,680	52,135			88,494	3,069			141,075	3,214		
Cashes Bank	15,720	543			5,980	91			50,210	1,757			142,865	2,667		
Clark Bank	1,000	20														
Fippenies Bank	8,305	267			1,335	28			105,230	2,625			91,735	1,582		
Middle Bank	322,350	16,532			155,830	4,694			46,331	3,179			220,060	7,801		
Jeffreys Ledge	1,570,099	86,726			611,394	20,259			262,828	13,815			1,262,110	36,510		
Ipswich Bay	4,940	199			255	8			580	6			2,225	50		
South Channel	11,525,754	391,978			7,189,033	146,601			425,925	14,160			1,003,762	26,769		
Nantucket Shoals	104,707	2,818			16,197	235			420	11			585	9		
Off Highland Light	12,470	518			6,415	111			420	30			4,580	164		
Off Chatham	4,890,094	171,838			2,318,684	41,085			264,320	9,527			692,071	16,500		
Bay of Fundy	1,860	37			720	7			51,500	1,740			53,035	1,045		
Seal Island	92,055	4,024			38,855	912			5,170	190			4,120	90		
Shore, general	294,363	13,523			87,356	2,752			528,371	18,977			1,307,339	27,570		
Total	34,351,565	1,215,663			14,199,920	311,844			2,233,257	84,591			5,420,587	136,345		
LANDED AT GLOUCESTER.																
East of 66° west longitude.																
La Have Bank	102,765	1,410							232,080	3,296	2,795	$56				
Western Bank	777,155	9,949	575	$12	56,800	722			273,365	3,919	1,940	39			130	$2
Quereau Bank	1,358,061	19,455	16,730	321	23,226	293			792,747	12,954	38,536	731			190	3
Misaine Bank	137,735	1,722														
Green Bank	340	5							45,570	796	7,150	160	670	12	740	11
Grand Bank	33,321	467	13,329	264	14,134	141	300	$8	162,274	2,617	43,265	876				
St. Peters Bank	390	6	230	5					22,780	450	5,680	154				
Bacalieu Bank									30,680	454	6,610	129				
Cape North	16,710	230	7,073	143					87,225	1,135	20,715	405				

Cape Shore	170,418	2,079	25,500	512	8,000	88			166,515	2,812	5,822	149				
Gulf of St. Lawrence	10,555	127	3,830	99					78,625	1,193	2,499	64				
St. Anns Bank	14,345	109	120	4					7,145	92	510	9				
The Gully									40,151	741	425	7				
West of 66° west longitude.																
Browns Bank	1,229,771	16,844			198,038	2,396			82,870	1,071			11,770	147		
Georges Bank	1,438,285	23,552	8,483	192	52,860	634	80	1	64,993	976	70	1				
South Channel	246,310	3,448							550	8						
Nantucket Shoals	7,060	124	2,105	42												
Seal Island									420	5						
Shore, general	733,002	29,570	25	1					733,182	22,542	153	3	6,814	460		
Total	6,276,223	109,097	78,000	1,595	353,058	4,274	380	9	2,821,172	55,061	136,170	2,783	19,284	619	1,060	16
LANDED AT PORTLAND.																
East of 66° west longitude.																
La Have Bank	22,360	276							25,400	394			5,650	76		
Western Bank	1,085,513	13,372			73,710	1,323			4,650	150			9,660	140		
Quereau Bank									6,610	99						
Grand Bank													4,000	74		
St. Peters Bank	57,080	885	96,780	2,257											845	19
Cape North	600	9														
Cape Shore	26,375	646			4,510	45			280	11			4,910	55		
West of 66° west longitude.																
Browns Bank	5,700	201			1,100	28										
Georges Bank	2,515	32							73,970	1,752			46,625	673		
Cashes Bank	5,510	206			3,135	39			53,417	1,049			119,970	2,007		
Jeffreys Ledge	88,458	4,815	2,910	146	30,395	687	600	18	41,758	2,110			221,052	5,199		
South Channel	2,001,614	27,222			435,297	5,228			29,483	422			73,013	812		
Shore, general	1,186,191	57,562	5,126	258	160,667	3,928	500	10	497,120	15,427	528	27	1,317,223	27,230	4,605	99
Total	4,481,916	105,226	104,816	2,661	708,814	11,278	1,100	28	732,688	21,414	528	27	1,802,103	36,266	5,450	118
Grand total	45,109,704	1,429,986	182,816	4,256	15,261,792	327,396	1,480	37	5,787,117	161,066	136,698	2,810	7,241,974	173,230	6,510	134

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1916, SHOWN BY FISHING GROUNDS—Continued.

Fishing grounds.	Pollock.				Cusk.				Halibut.			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
LANDED AT BOSTON.												
East of 66° west longitude.												
La Have Bank	15,464	$320			161,687	$3,076			18,958	$2,904		
Western Bank	96,209	2,870			7,105	142			30,219	4,339		
Quereau Bank	420	4			18,500	309			53,075	5,066		
Green Bank									50,000	4,000		
Grand Bank									183,000	17,200		
Burgeo Bank									50,000	5,500		
Cape Shore	43,485	1,285			139,552	3,144			17,420	2,544		
Gulf of St. Lawrence									55,000	5,500		
St. Anns Bank	425	6							168	76		
West of 66° west longitude.												
Browns Bank	272,912	7,633			1,612,334	32,561			197,570	33,786		
Georges Bank	416,647	10,494			208,714	4,971			273,703	31,203		
Cashes Bank	17,230	461			117,598	2,222			1,732	243		
Clark Bank	200	4							3,416	471		
Fippenies Bank	4,405	112			79,303	1,485			824	107		
Middle Bank	23,478	832			42,172	1,124			1,853	407		
Jeffreys Ledge	1,397,417	41,022			444,829	10,426			13,104	2,479		
Ipswich Bay	6,135	150			1,900	62			1,817	272		
South Channel	367,970	10,381			236,327	5,592			102,697	14,753		
Nantucket Shoals	42,938	1,280			2,840	73			37,771	4,683		
Off Highland Light	760	20			515	15			77	9		
Off Chatham	802,846	24,078			53,360	1,187			39,877	6,884		
Bay of Fundy	2,410	64			35,290	684			111	12		
Seal Island	5,800	144			71,068	1,653			1,148	280		
Shore, general	275,018	7,637			424,335	8,976			8,415	1,410		
Total	3,792,169	108,797			3,657,429	77,702			1,141,955	144,128		
LANDED AT GLOUCESTER.												
East of 66° west longitude.												
La Have Bank	5,625	72	600	$13	99,345	1,417	1,020	$28	65,059	6,269	1,307	[illegible]
Western Bank	55,935	662	3,310	51	191,819	2,924	9,136	225	[illegible]	17,089	7,615	670
Quereau Bank	52,757	684	13,300	263	503,971	7,695	2,825	65	[illegible]	26,389	5,611	337

Misaine Bank	19,950	249										
Green Bank	1,690	24	1,250	31	560	10	500	10	22,734	3,011		
Grand Bank	3,120	41	16,010	344	45,230	737	5,310	129	474,808	45,272	14,807	1,107
St. Peters Bank	430	6			1,575	30	155	5	34,611	4,297	1,945	106
Burgeo Bank											3,800	294
Bacalieu Bank	110	2			4,400	83	1,580	31	96,445	8,469	3,122	256
Cape North	660	8	3,290	66	980	15	335	9	19,225	1,743	1,845	110
Cape Shore	14,750	193	1,033	25	182,430	2,570	2,625	108	33,104	3,802		
Gulf of St. Lawrence	603	8	3,350	68	6,335	101	105	2	56,893	5,658	11,902	1,008
St. Anns Bank	140	1	120	3	160	2	1,650	40	29,905	2,719		
The Gully	380	5	165	3	7,480	114	180	5	234,566	31,807		
Labrador Coast											42,975	4,449
West of 66° west longitude.												
Browns Bank	41,133	449			144,838	1,848			21,226	1,776		
Georges Bank	83,240	1,322	31,010	675	188,758	2,568	2,705	69	118,181	11,046	315	26
South Channel	920	12			220	3						
Nantucket Shoals	2,570	46	4,297	85	470	6	5,780	141				
Seal Island	1,230	15			104,245	1,299			51,447	5,938		
Shore, general	9,831,950	232,261	313	5	66,110	841	94	2				
Total	10,117,193	236,060	78,168	1,635	1,553,926	22,263	34,000	869	1,686,252	175,285	95,244	8,510
LANDED AT PORTLAND.												
East of 66° west longitude.												
La Have Bank	2,445	43	720	22	17,030	271			77,074	8,006		
Western Bank	54,066	557			17,190	250			49,558	4,560		
Quereau Bank	200	3			670	10			34,792	3,942		
Green Bank									15,315	1,789		
Grand Bank									144,899	16,079		
St. Peters Bank			580	13								
Bacalieu Bank									12,937	1,493		
Cape North									40,472	2,800		
Cape Shore	1,480	15			1,380	24			42,796	6,081		
The Gully									43,121	4,944		
West of 66° west longitude.												
Browns Bank	775	16							13,762	1,769		
Georges Bank	1,275	22			2,595	59			42,297	4,380		
Cashes Bank	16,622	368			70,345	1,351			691	82		
Jeffreys Ledge	24,680	623			142,961	2,867	6,335	47	2,432	283		
South Channel	9,094	94							3,445	176		
Shore, general	1,482,488	34,980	21,675	368	553,001	13,618	11,435	119	11,723	1,278		
Total	1,593,125	36,721	22,975	403	805,172	18,450	17,770	166	535,314	57,662		
Grand total	15,502,487	381,578	101,143	2,038	6,016,527	118,415	51,770	1,035	3,363,521	377,075	95,244	8,510

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1916, SHOWN BY FISHING GROUNDS—Continued.

Fishing grounds.	Mackerel.											
	Large (over $2\frac{1}{4}$ pounds).				Medium ($1\frac{1}{2}$ to $2\frac{1}{4}$ pounds).				Small (under $1\frac{1}{2}$ pounds).			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
LANDED AT BOSTON.												
East of 66° west longitude.												
Quereau Bank	6,255	$438			6,990	$315						
Cape Shore	868,199	40,383	20,000	$1,350	179,887	6,557			29,500	$770		
West of 66° west longitude.												
Georges Bank	1,197,545	89,407			168,452	9,800			16,630	1,404		
Cashes Bank	24,855	1,988			19,215	1,441						
Middle Bank	147,120	11,825			142,242	8,889			87,155	5,385		
South Channel	46,300	2,529			28,600	1,061			2,257	96		
Nantucket Shoals	214,972	9,008			71,353	2,635			120,167	3,957		
Off Highland Light					5,750	265						
Off Chatham	711,049	34,333			306,906	13,576	9,400	$705	199,337	8,307		
Off Race Point	55,825	5,024			28,825	2,556			14,600	529		
Shore, general	1,919,272	132,869			1,382,875	99,474	38,400	3,456	421,449	21,922	8,600	$860
Total	5,191,392	327,874	20,000	1,350	2,341,095	146,569	47,800	4,161	891,095	42,370	8,600	860
LANDED AT GLOUCESTER.												
East of 66° west longitude.												
Cape Shore			502,800	34,574			118,200	7,977				
West of 66° west longitude.												
Georges Bank	54,376	2,433	438,000	42,506	131,154	6,686	931,200	88,508	28,340	1,019	34,200	2,787
Middle Bank	2,000	190	43,600	4,131	228,535	11,261	523,000	49,621			2,000	183
Nantucket Shoals	62,968	3,120	157,200	13,975	34,000	1,801	420,200	35,399	58,454	3,706	685,600	50,942
Off Chatham	119,591	4,890	1,400	128	441,541	17,545	101,588	9,192	123,396	3,813	20,035	1,701
South			600	33							1,400	49
Shore, general	105,903	3,885	679,466	52,779	44,932	2,064	140,943	12,481	219,282	9,801	188,461	8,046
Total	344,838	14,518	1,823,066	148,126	880,162	39,357	2,235,131	203,178	429,472	18,339	931,696	63,708

LANDED AT PORTLAND.												
West of 66° west longitude.												
Shore, general	213,873	11,792			217,124	10,953	1,055	108	322,580	15,767	7,370	258
Total	213,873	11,792			217,124	10,953	1,055	108	322,580	15,767	7,370	258
Grand total	5,750,103	354,184	1,843,066	149,476	3,438,381	196,879	2,283,986	207,447	1,643,147	76,476	947,666	64,826

Fishing grounds.	Miscellaneous.				Total.				Grand total.	
	Fresh.		Salted.		Fresh.		Salted.			
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
LANDED AT BOSTON.										
East of 66° west longitude.										
La Have Bank	15,844	$944			838,202	$23,072			838,202	$23,072
Western Bank	54,418	2,164			5,332,007	172,651			5,332,007	172,651
Quereau Bank	225	32			172,467	8,382			172,467	8,382
Green Bank					70,000	5,000			70,000	5,000
Grand Bank					183,000	17,200			183,000	17,200
Burgeo Bank					50,000	5,500			50,000	5,500
Off Newfoundland	a 804,400	24,132			804,400	24,132			804,400	24,132
Cape Shore	151,895	21,532			4,779,522	200,485	20,000	$1,350	4,799,522	201,835
Gulf of St. Lawrence					55,000	5,500			55,000	5,500
St. Anns Bank					211,513	7,229			211,513	7,229
West of 66° west longitude.										
Browns Bank	103,163	3,138			13,125,441	419,131			13,125,441	419,131
Georges Bank	1,841,303	222,794			14,352,452	746,850			14,352,452	746,850
Cashes Bank	18,420	446			492,935	14,543			492,935	14,543
Clark Bank	297	44			7,513	618			7,513	618
Fippenies Bank	11,730	220			336,361	7,761			336,361	7,761
Middle Bank	35,207	1,370			1,311,539	66,183			1,311,539	66,183
Jeffreys Ledge	230,692	6,006			6,436,661	247,486			6,436,661	247,486
Ipswich Bay	831	16			183,075	7,074			183,075	7,074
South Channel	1,597,056	47,892			24,583,383	756,796			21,583,383	756,796
Nantucket Shoals	60,548	930			1,814,947	68,567			1,814,947	68,567

a Herring. Other items under "Miscellaneous" include bluebacks, 1,882,457 pounds, value $10,605; bluefish, 48,024 pounds, value $530; butterfish, 185,675 pounds, value $9,420; catfish or wolffish, 216,763 pounds, value $4,629; flounders, 1,297,886 pounds, value $46,684; grayfish, 377,561 pounds, value $2,194; herring, 7,361,005 pounds, value $66,646; horse mackerel, 7,175 pounds, value $176; redfish, 117,222 pounds, value $1,942; salmon, 455 pounds, value $61; shad, 444,863 pounds, value $20,615; sharks, 12,959 pounds, value $268; skates, 184,556 pounds, value $2,767; smelt, 58,267 pounds, value $4,153; sturgeon, 2,221 pounds, value $144; swordfish, 1,773,452 pounds, value $238,346; tilefish, 873,142 pounds, value $24,295; lobster, 6,978 pounds, value $1,793; squid, 80 pounds, value $1; livers, 1,110,408 pounds, value $15,600; sounds, 105,825 pounds, value $5,881; spawn, 93,649 pounds, value $7,288; cod cheeks, 313 pounds, value $13; tongues, fresh, 3,520 pounds, value $114; and tongues, salted, 40 pounds, value $2.

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1916, SHOWN BY FISHING GROUNDS—Continued.

Fishing grounds.	Miscellaneous.				Total.				Grand total.	
	Fresh.		Salted.		Fresh.		Salted.			
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
LANDED AT BOSTON—continued.										
West of 66° west longitude—Continued.										
Off Highland Light	5,800	$56			43,181	$1,419			43,181	$1,419
Off Chatham	493,507	9,466			14,087,116	478,280	9,400	$705	14,096,516	478,985
Off Race Point	8,000	120			107,250	8,229			107,250	8,229
Bay of Fundy	7,200	166			163,786	4,096			163,786	4,096
Seal Island	2,945	51			290,031	10,212			290,031	10,212
South	928,142	25,304			928,142	25,304			928,142	25,304
Shore, general	340,850	8,407			7,494,714	364,294	47,000	4,316	7,541,714	368,610
Total	6,712,473	375,230			98,254,638	3,695,994	76,400	6,371	98,331,038	3,702,365
LANDED AT GLOUCESTER.										
East of 66° west longitude.										
La Have Bank					561,154	13,707	38,347	1,589	599,501	15,296
Western Bank					3,901,536	90,697	152,376	5,957	4,053,912	96,654
Quereau Bank	260	20			7,849,177	182,700	979,002	44,341	8,828,179	227,041
Misaine Bank					373,930	6,472			373,930	6,472
Green Bank					88,549	4,313	48,835	2,084	137,384	6,397
Grand Bank	735	74			1,280,154	62,616	2,521,155	107,683	3,801,309	170,299
St. Peters Bank					125,076	6,629	27,000	1,400	152,076	8,029
Burgeo Bank							8,575	517	8,575	517
Bacalieu Bank					280,095	12,857	268,407	12,504	548,502	25,361
Off Newfoundland	a 3,244,611	118,527	a 7,223,224	$183,344	3,244,611	118,527	7,400,224	188,839	10,644,835	307,366
Cape North					1,027,315	24,215	1,711,729	70,447	2,739,044	94,662
Cape Shore	250	25			979,187	21,398	727,085	46,747	1,706,272	68,145
Gulf of St. Lawrence					759,522	21,253	1,122,350	53,565	1,881,872	74,818
St. Anns Bank					541,850	12,362	50,035	2,403	591,885	14,765
The Gully					317,483	33,634	38,480	1,918	355,963	35,552
Labrador coast							56,185	5,025	56,185	5,025
West of 66° west longitude.										
Browns Bank					2,889,454	50,811	26,245	1,266	2,915,699	52,077
Georges Bank					3,429,860	79,000	1,973,351	161,067	5,403,211	240,067
Middle Bank					230,535	11,451	568,600	53,935	799,135	65,386

South Channel					267,095	3,924			267,095	3,924
Nantucket Shoals					219,592	10,598	1,310,957	102,100	1,530,549	112,698
Off Chatham	16,350	96			700,878	26,344	123,023	11,021	823,901	37,365
Seal Island					184,572	7,924			184,572	7,924
South							2,000	82	2,000	82
Shore, general	4,056,377	41,431			17,263,652	410,581	1,011,310	73,391	18,274,962	483,972
Total	7,318,583	160,173	7,223,224	183,344	46,515,277	1,212,013	20,165,271	947,881	66,680,548	2,159,894
LANDED AT PORTLAND.										
East of 66° west longitude.										
La Have Bank	7,022	163			167,708	9,794	5,925	274	173,633	10,068
Western Bank	6,167	97			1,483,777	23,158			1,483,777	23,158
Quereau Bank	365	18			49,697	4,250			49,697	4,250
Green Bank					15,315	1,789			15,315	1,789
Grand Bank	360	22			172,049	16,695	36,125	1,532	208,174	18,227
St. Peters Bank					64,695	1,068	145,130	4,144	209,825	5,212
Bacalieu Bank					12,937	1,493			12,937	1,493
Cape North					83,482	4,800			83,482	4,800
Cape Shore					89,836	7,063			89,036	7,063
The Gully					43,121	4,944			43,121	4,944
West of 66° west longitude.										
Browns Bank	485	38	40	2	28,647	2,371	40	2	28,687	2,373
Georges Bank	17,938	1,969			273,641	11,201	8,325	385	281,966	11,586
Cashes Bank	510,275	4,678			827,119	11,306			827,119	11,306
Jeffreys Ledge	18,512	325			675,884	21,492	9,845	211	685,729	21,703
South Channel	73,010	763			2,708,792	36,159			2,708,792	36,159
Shore, general	5,548,277	63,348			13,854,694	356,088	56,055	1,428	13,910,749	357,516
Total	6,182,411	71,421	40	2	20,551,394	513,671	261,445	7,976	20,812,839	521,647
Grand total	20,213,467	606,824	7,223,264	183,346	165,321,309	5,421,678	20,503,116	962,228	185,824,425	6,383,906

a See footnote, p. 21.

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE YEAR 1916, SHOWN BY MONTHS.

Month.	Number of trips.	Cod.											
		Large (10 pounds and over).				Market (under 10 and over 2½ pounds).				Scrod (1 to 2½ pounds).			
		Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
		Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
LANDED AT BOSTON.													
January	195	447,547	$23,270			495,444	$13,517			78,189	$1,212		
February	184	496,769	26,994			568,061	16,725			70,506	1,129		
March	220	478,426	32,802			507,323	22,337			34,737	991		
April	232	966,503	34,937			856,104	22,571			34,627	620		
May	244	1,301,917	38,703			1,259,076	29,986			42,521	624		
June	261	893,493	43,001			1,120,179	33,639			93,910	1,328		
July	316	669,594	39,243			1,186,357	40,529			105,506	1,525		
August	371	648,315	40,050			1,187,093	40,996			179,070	2,848		
September	315	643,537	37,410			866,120	30,236			92,546	1,557		
October	327	448,421	30,716			519,933	24,501			62,444	1,400		
November	234	316,698	21,558			472,030	19,133			143,760	3,198		
December	190	338,591	21,042			562,253	21,380			134,101	3,173		
Total	3,089	7,649,811	389,726			9,599,973	315,550			1,071,917	19,605		
LANDED AT GLOUCESTER.													
January	197	122,407	3,597	185,625	$5,818	118,225	1,773	2,745	$86	4,890	37		
February	103	133,372	6,344	25,200	1,252	63,700	772	8,225	337	6,555	19	950	$29
March	174	196,295	11,976	30,115	1,379	29,071	714	14,880	592	340	3	405	11
April	420	1,440,165	51,229	91,750	4,564	531,782	11,769	18,430	743	9,580	84		
May	457	1,871,988	49,014	120,861	5,898	1,510,891	33,197	72,857	2,927	96,480	802	2,990	62
June	144	1,132,047	27,395	1,209,478	54,094	1,322,235	29,478	708,102	28,285	133,522	1,009	60,435	1,640
July	158	897,686	23,723	1,163,741	52,516	953,370	21,681	563,348	21,742	36,751	310	49,476	1,331
August	181	752,130	19,259	695,805	32,283	981,935	22,373	464,795	18,380	44,126	363	53,580	1,375
September	181	522,563	14,528	265,260	12,857	655,524	15,544	385,595	16,323	26,037	209	45,675	1,599
October	145	432,702	9,377	410,830	24,802	332,789	8,026	253,925	10,873	10,480	80	46,250	1,045
November	369	159,003	7,032	203,140	11,640	59,555	1,509	251,295	13,147	2,720	27	34,574	1,513
December	335	65,548	2,326	44,890	2,754	50,930	1,273	39,515	2,077	7,720	85	4,390	134
Total	2,864	7,725,906	225,800	4,446,695	209,857	6,610,007	148,109	2,783,712	115,512	379,201	3,058	298,725	8,739

LANDED AT PORTLAND.													
January	140	77,741	4,366	....	....	104,895	3,552	....	....	30,016	321	....	....
February	171	123,939	6,806	....	....	95,148	3,255	....	....	26,535	346	....	....
March	378	274,279	16,589	500	25	208,906	8,534	615	31	24,249	549	....	....
April	346	298,974	10,485	....	....	238,048	5,720	....	....	17,817	205	....	....
May	301	258,580	7,277	3,460	175	187,839	3,823	4,865	210	12,714	134	....	....
June	350	53,094	1,668	37,920	1,592	13,270	318	925	37	3,050	29	110	3
July	195	29,684	1,106	340	12	46,474	1,009	....	....	4,493	37	....	....
August	148	26,046	1,441	....	....	35,987	730	....	....	3,075	35	....	....
September	145	46,097	2,138	9,950	460	42,004	1,059	36,976	1,491	4,591	60	5,090	141
October	227	78,052	9,732	315	19	52,926	2,700	175	9	15,313	231	....	....
November	255	101,673	6,262	....	....	98,238	3,829	....	....	37,399	501	....	....
December	336	72,164	4,699	....	....	136,788	5,711	....	....	76,176	1,464	....	....
Total	2,992	1,440,323	72,569	51,585	2,283	1,260,523	40,240	43,556	1,778	255,428	3,912	5,200	144
Grand total	8,945	16,816,040	688,095	4,498,280	212,140	17,470,503	503,899	2,827,268	117,290	1,706,546	26,575	303,925	8,883
Grounds E. of 66° W. long	592	6,214,476	178,935	4,125,084	193,000	6,833,933	161,363	2,607,010	106,994	489,707	5,631	294,130	8,595
Grounds W. of 66° W. long	8,353	10,601,564	509,160	373,196	19,140	10,636,570	342,536	220,258	10,296	1,216,839	20,944	9,795	288
Landed at Boston in 1915 [a]	3,772	7,181,682	317,507	....	....	11,928,214	283,911	....	....	1,109,757	14,857	695	14
Landed at Gloucester in 1915 [a]	3,472	7,386,852	170,397	6,679,925	241,707	6,225,910	100,123	3,994,245	134,725	255,709	2,057	292,908	7,662

Month.	Haddock.								Hake.							
	Large (over 2½ pounds).				Scrod (1 to 2½ pounds).				Large (6 pounds and over).				Small (under 6 pounds).			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
LANDED AT BOSTON.																
January	2,614,870	$112,289	....	....	715,491	$21,580	....	....	113,607	$5,744	....	....	239,108	$8,306	....	....
February	3,574,772	130,650	....	....	1,369,415	31,260	....	....	46,799	3,122	....	....	107,520	4,510	....	....
March	3,515,847	174,584	....	....	1,130,962	42,881	....	....	48,980	3,350	....	....	105,619	6,571	....	....
April	4,371,590	94,314	....	....	1,161,946	15,593	....	....	119,593	5,491	....	....	538,108	10,710	....	....
May	2,410,927	62,873	....	....	1,156,134	17,525	....	....	244,459	6,552	....	....	723,447	11,176	....	....
June	2,028,340	70,105	....	....	1,364,695	20,917	....	....	230,035	7,378	....	....	462,367	8,656	....	....
July	2,134,437	59,595	....	....	1,262,190	16,790	....	....	201,035	6,254	....	....	412,747	8,266	....	....
August	3,072,192	79,674	....	....	1,464,448	22,639	....	....	298,051	8,974	....	....	522,506	11,095	....	....
September	3,215,211	85,459	....	....	1,355,467	20,922	....	....	386,023	11,411	....	....	572,676	12,498	....	....
October	3,046,875	118,774	....	....	1,281,247	33,306	....	....	242,384	11,524	....	....	738,755	21,266	....	....
November	2,184,829	103,177	....	....	984,554	31,602	....	....	194,578	8,281	....	....	609,825	17,697	....	....
December	2,181,675	124,169	....	....	953,371	36,829	....	....	107,713	6,510	....	....	387,909	15,594	....	....
Total	34,351,565	1,215,663	....	....	14,199,920	311,844	....	....	2,233,257	84,591	....	....	5,420,587	136,345	....	....

[a] Statistics of the fishery products landed at Portland in 1915 are not available for the entire year, and are therefore not shown in this statement.

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE YEAR 1916, SHOWN BY MONTHS—Continued.

Month.	Haddock.								Hake.							
	Large (over $2\frac{1}{2}$ pounds).				Scrod (1 to $2\frac{1}{2}$ pounds).				Large (6 pounds and over).				Small (under 6 pounds).			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
LANDED AT GLOUCESTER.																
January	21,524	$1,264							15,410	$1,013	680	$12				
February	31,705	1,258	16,800	$294					3,870	54	2,535	44				
March	95,283	2,582	560	10	52,780	$633			2,056	62	265	4				
April	984,155	23,459	100	2	55,285	705			17,905	237	1,530	29	11,770	$147	740	$11
May	1,421,370	24,456	510	18	163,864	1,864	80	$1	315,060	3,939	268	5			130	2
June	502,171	6,703	14,218	285	63,654	852			266,550	3,491	23,416	463				
July	366,317	4,767	12,127	236	1,945	10			282,898	3,854	42,851	848				
August	1,056,015	15,211	23,725	499	15,530	210	300	8	892,015	13,460	28,075	518				
September	1,402,718	23,349	1,225	28					454,387	7,959	3,310	67				
October	386,540	5,999	4,775	107					164,006	3,236	22,745	478	7,514	472	190	3
November	6,935	19	500	17					351,817	14,732	5,205	156				
December	1,490	30	3,460	99					55,198	3,024	5,290	159				
Total	6,276,223	109,097	78,000	1,595	353,058	4,274	380	9	2,821,172	55,061	136,170	2,783	19,284	619	1,060	16
LANDED AT PORTLAND.																
January	212,607	10,343	5,020	253	54,055	866	500	10	20,729	1,144	375	23	60,818	1,625	1,175	31
February	139,796	6,501			29,021	588			10,982	663			38,973	1,103	65	3
March	168,450	10,610			38,435	1,190			10,880	759			50,624	1,872		
April	416,471	8,287			44,080	542			29,445	1,208			159,699	3,119		
May	1,047,414	15,739			38,667	912			39,850	823			309,918	4,128		
June	139,988	1,989			254,691	3,147			20,440	424			107,411	1,400	2,230	45
July	667,318	9,212			62,120	677			73,891	1,670			192,621	2,982		
August	489,063	6,045			76,530	1,023			24,505	728			175,922	2,843	1,135	20
September	673,041	10,112	96,886	2,262	46,455	620			317,148	6,921	153	4	107,240	1,709	845	19
October	117,347	4,292	2,910	146	18,979	413	600	18	125,526	4,236			337,747	8,892		
November	167,616	9,068			19,919	520			42,533	1,864			205,691	4,859		
December	242,775	13,028			25,862	750			16,759	974			55,439	1,734		
Total	4,481,916	105,226	104,816	2,661	708,814	11,278	1,100	28	732,688	21,414	528	27	1,802,103	36,266	5,450	118
Grand total	45,109,704	1,429,986	182,816	4,256	15,261,792	327,396	1,480	37	5,787,117	161,066	136,698	2,810	7,241,974	173,230	6,510	134

Grounds E. of 66° W. long	9,153,038	235,356	164,167	3,617	1,233,710	28,518	300	8	2,180,546	38,450	135,947	2,779	318,629	7,789	1,905	35
Grounds W. of 66° W. long	35,951,666	1,194,630	18,649	639	14,023,032	298,878	1,180	29	3,606,571	122,616	751	31	6,923,345	165,441	4,605	99
Landed at Boston in 1915	36,035,096	1,014,223	....	....	11,304,369	166,064	....	....	2,842,606	93,190	5,000	75	6,820,297	119,954	....	....
Landed at Gloucester in 1915	8,913,010	117,437	130,594	2,361	1,060,575	7,723	....	....	4,926,412	64,326	295,625	4,932	....	....	....	....

Month.	Pollock.				Cusk.				Halibut.			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
LANDED AT BOSTON.												
January	94,398	$2,956	....	....	172,689	$4,225	....	....	10,935	$3,702	....	....
February	90,355	3,560	....	....	335,009	7,321	....	....	36,785	7,104	....	....
March	91,364	4,199	....	....	363,843	10,654	....	....	48,159	9,390	....	....
April	163,485	4,054	....	....	869,445	14,088	....	....	103,043	16,398	....	....
May	217,788	4,284	....	....	470,311	7,568	....	....	128,985	16,024	....	....
June	263,596	7,880	....	....	133,628	2,902	....	....	253,905	27,880	....	....
July	398,584	12,678	....	....	200,067	4,154	....	....	165,766	16,815	....	....
August	631,117	19,083	....	....	186,167	3,643	....	....	211,714	21,206	....	....
September	725,832	18,692	....	....	178,889	3,906	....	....	123,107	13,287	....	....
October	647,157	18,563	....	....	243,033	6,329	....	....	32,273	5,473	....	....
November	277,223	7,404	....	....	299,069	7,386	....	....	16,178	4,009	....	....
December	191,270	5,444	....	....	205,279	5,526	....	....	11,105	2,840	....	....
Total	3,792,169	108,797	....	....	3,657,429	77,702	....	....	1,141,955	144,128	....	....
LANDED AT GLOUCESTER.												
January	753,418	27,289	....	....	....	....	160	$4	25,600	3,785	....	....
February	68,010	3,296	180	$3	7,405	104	230	6	135,848	16,283	....	....
March	46,807	2,353	1,500	26	....	....	160	5	92,757	11,553	1,815	$130
April	273,685	8,283	4,640	93	78,565	1,001	7,066	169	206,880	27,440	4,585	357
May	940,821	16,886	5,888	183	328,630	4,201	244	5	218,306	20,196	277	22
June	327,255	3,959	20,980	397	169,730	2,247	4,005	97	335,334	31,465	30,126	2,380
July	51,431	582	25,667	495	338,540	4,962	8,895	215	173,400	16,465	8,846	761
August	28,023	370	4,013	77	311,599	4,782	6,085	138	195,408	18,078	3,732	284
September	59,730	885	5,680	126	181,727	2,835	575	11	164,411	14,487	43,957	4,473
October	120,884	3,812	5,635	120	131,970	2,041	3,110	85	86,485	8,875	801	59
November	3,783,668	77,589	655	16	4,305	62	2,790	112	35,492	4,448	....	....
December	3,663,461	90,756	3,330	99	1,455	28	680	22	16,331	2,210	1,105	44
Total	10,117,193	236,060	78,168	1,635	1,553,926	22,263	34,000	869	1,686,252	175,285	95,244	8,510

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE YEAR 1916, SHOWN BY MONTHS—Continued.

Month.	Pollock.				Cusk.				Halibut.			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
LANDED AT PORTLAND.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
January	55,532	$1,448			43,487	$1,197			11,421	$1,628		
February	138,147	4,850	1,540	$31	38,345	1,161			24,877	2,958		
March	275,730	12,191	8,908	210	91,868	2,877			58,078	6,612		
April	252,382	4,889	9,325	93	135,738	2,441	6,330	$41	62,214	8,259		
May	385,045	3,435	425	5	126,730	1,865	1,155	6	80,055	6,431		
June	73,998	843	340	14	15,823	249	1,275	30	43,470	4,826		
July	43,606	784			37,124	824			61,691	5,983		
August	23,695	528			21,040	519	3,900	39	85,204	8,709		
September	17,728	363	1,435	38	33,964	739	325	2	52,766	5,552		
October	69,686	2,001	752	8	129,936	3,106	1,130	8	34,028	3,526		
November	127,061	2,527	250	4	83,205	2,003	3,270	33	19,994	2,985		
December	130,515	2,862			47,912	1,469	385	7	1,516	193		
Total	1,593,125	36,721	22,975	403	805,172	18,450	17,770	166	535,314	57,662		
Grand total	15,502,487	381,578	101,143	2,038	6,016,527	118,415	51,770	1,035	3,363,521	377,075	95,244	$8,510
Grounds E. of 66° W. long	370,344	7,058	43,848	905	1,412,399	22,924	25,421	657	2,414,202	253,348	94,929	8,484
Grounds W. of 66° W. long	15,132,143	374,520	57,295	1,133	4,604,128	95,491	26,349	378	949,319	123,727	315	26
Landed at Boston in 1915	4,284,447	103,733			3,321,681	53,127			930,409	102,327		
Landed at Gloucester in 1915	8,676,866	145,455	234,640	4,070	2,914,120	42,876	91,943	2,347	2,653,766	199,460	286,510	21,509

Month.	Mackerel.											
	Large (over 2¼ pounds).				Medium (1½ to 2¼ pounds).				Small (under 1½ pounds).			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
LANDED AT BOSTON.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
May	840	$235			693	$151						
June	1,052,091	48,554	20,000	$1,350	251,814	9,591			286,047	$10,209		
July	735,241	34,651			272,924	11,408	9,400	$705	300,937	12,023		

August	1,320,515	101,880	....	....	280,662	16,944	....	....	170,199	11,514	....	....
September	939,178	56,940	....	....	304,533	16,582	38,400	3,456	24,158	1,630	....	....
October	727,455	57,763	....	....	901,224	70,262	....	....	109,754	6,994	8,600	$860
November	416,072	27,851	....	....	326,245	21,631	....	....	....	....	....	....
Total	5,191,392	327,874	20,000	1,350	2,341,095	146,569	47,800	4,161	891,095	42,370	8,600	860
LANDED AT GLOUCESTER.												
May	....	....	600	33	....	....	....	....	....	....	1,400	49
June	22,390	560	466,000	32,101	....	....	126,800	8,590	16,930	54	79,290	2,976
July	56,803	2,931	109,800	8,784	106,155	4,999	322,915	26,370	189,164	8,415	772,556	54,404
August	28,430	1,275	319,200	31,842	548,049	25,353	1,204,843	116,022	52,704	1,775	34,850	2,373
September	212,935	8,255	645,066	58,234	207,422	7,954	567,373	50,942	72,277	2,107	43,600	3,906
October	24,280	1,497	282,400	17,132	....	....	....	....	98,397	5,988	....	....
November	....	....	....	....	18,536	1,051	13,200	1,254	....	....	....	....
Total	344,838	14,518	1,823,066	148,126	880,162	39,357	2,235,131	203,178	429,472	18,339	931,696	63,708
LANDED AT PORTLAND.												
June	2,062	125	....	....	889	70	....	....	2,304	150	....	....
July	6,896	595	....	....	20,880	1,247	....	....	69,693	3,540	....	....
August	791	96	....	....	2,231	210	1,055	108	17,019	1,283	....	....
September	174,294	8,670	....	....	171,354	9,047	....	....	233,564	10,794	7,370	258
October	28,875	2,182	....	....	21,770	379	....	....	....	....	....	....
November	955	124	....	....	....	....	....	....	....	....	....	....
Total	213,873	11,792	....	....	217,124	10,953	1,055	108	322,580	15,767	7,370	258
Grand total	5,750,103	354,184	1,843,066	149,476	3,438,381	196,879	2,283,986	207,447	1,643,147	76,476	947,666	64,826
Grounds E. of 66° W. long	874,454	40,821	522,800	35,924	186,877	6,872	118,200	7,977	29,500	770	....	....
Grounds W. of 66° W. long	4,875,649	313,363	1,320,266	113,552	3,251,504	190,007	2,165,786	199,470	1,613,647	75,706	947,666	64,826
Landed at Boston in 1915	638,888	63,851	145,898	6,835	851,391	72,715	85,596	4,987	3,839,104	168,782	265,013	11,049
Landed at Gloucester in 1915	56,125	3,870	869,200	41,534	149,134	6,797	67,700	5,012	1,809,932	67,001	2,140,421	161,646

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., BY AMERICAN FISHING VESSELS DURING THE YEAR 1916, SHOWN BY MONTHS—Continued.

Month.	Miscellaneous.[a]				Total.				Grand total.	
	Fresh.		Salted.		Fresh.		Salted.			
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
LANDED AT BOSTON.										
January	248,563	$8,092			5,230,841	$204,893			5,230,841	$204,893
February	715,017	23,515			7,411,008	255,890			7,411,008	255,890
March	85,210	5,342			6,410,470	313,101			6,410,470	313,101
April	115,824	2,974			9,300,268	221,750			9,300,268	221,750
May	317,278	6,016			8,274,376	201,717			8,274,376	201,717
June	465,689	11,335			8,899,789	303,375	20,000	$1,350	8,919,789	304,725
July	1,360,675	113,066			9,406,060	376,997	9,400	705	9,415,460	377,702
August	1,230,249	106,570			11,402,298	487,116			11,402,298	487,116
September	817,032	47,257			10,244,309	357,787	38,400	3,456	10,282,709	361,243
October	467,771	19,347			9,471,726	426,218	8,600	860	9,480,326	427,078
November	651,640	21,314			6,892,701	294,241			6,892,701	294,241
December	237,525	10,402			5,310,792	252,909			5,310,792	252,909
Total	6,712,473	375,230			98,254,638	3,695,994	76,400	6,371	98,331,038	3,702,365
LANDED AT GLOUCESTER.										
January	1,729,111	65,484	4,410,752	$106,262	2,790,585	104,242	4,599,962	112,182	7,390,547	216,424
February	1,403,000	49,105	880,368	22,310	1,853,465	77,265	934,488	24,275	2,787,953	101,540
March	112,500	3,938	332,196	7,649	627,889	33,814	381,896	9,806	1,009,785	43,620
April	20,000	250			3,629,772	124,604	128,841	5,968	3,758,613	130,572
May	812,330	8,357			7,679,740	162,912	206,105	9,205	7,885,845	172,117
June	569,360	5,600			4,861,178	112,813	2,742,850	131,308	7,604,028	244,121
July	432,225	2,710			3,886,685	95,409	3,080,222	167,702	6,966,907	263,111
August	594,196	3,873			5,500,160	126,382	2,839,003	203,799	8,339,163	330,181
September	915,021	5,805			4,874,752	103,917	2,007,316	148,566	6,882,068	252,483
October	472,921	3,760			2,268,968	53,163	1,030,661	54,704	3,299,629	107,867
November	257,919	11,291			4,679,950	117,760	511,359	27,855	5,191,309	145,615
December			1,599,908	47,123	3,862,133	99,732	1,702,568	52,511	5,564,701	152,243
Total	7,318,583	160,173	7,223,224	183,344	46,515,277	1,212,013	20,165,271	947,881	66,680,548	2,159,894
LANDED AT PORTLAND.										
January	5,195	54			676,496	26,544	7,070	317	683,566	26,861
February	11,115	125	40	2	676,878	28,356	1,645	36	678,523	28,392
March	33,391	870			1,234,890	62,653	10,023	266	1,244,913	62,919
April	11,051	221			1,665,919	45,376	15,655	134	1,681,574	45,510
May	1,096,103	10,376			3,582,915	54,973	9,905	396	3,592,820	55,369
June	3,965,313	34,481			4,695,803	49,719	41,900	1,721	4,737,703	51,440

July	494,500	8,257			1,810,991	37,923	340	12	1,811,331	37,935
August	228,252	6,267			1,209,360	30,457	6,090	167	1,215,450	30,624
September	124,328	3,674			2,044,574	61,458	159,030	4,675	2,203,604	66,133
October	112,412	2,804			1,142,597	44,494	5,882	208	1,148,479	44,702
November	58,441	2,202			962,755	36,744	3,520	37	966,275	36,781
December	42,310	2,090			848,216	34,974	385	7	848,601	34,981
Total	6,182,411	71,421	40	2	20,551,394	513,671	261,445	7,976	20,812,839	521,647
Grand total	20,213,467	606,824	7,223,264	183,346	165,321,309	5,421,678	20,503,116	962,228	185,824,425	6,383,906
Grounds E. of 66° W. long	4,286,552	167,750	7,223,224	183,344	36,008,367	1,155,585	15,356,965	552,319	51,365,332	1,707,904
Grounds W. of 66° W. long	15,926,915	439,074	40	2	129,312,942	4,266,093	5,146,151	409,909	134,459,093	4,676,002
Landed at Boston in 1915	5,809,344	314,113			97,397,285	2,888,354	502,202	22,960	97,899,487	2,911,314
Landed at Gloucester in 1915	4,649,569	84,752	8,931,550	186,819	49,677,980	1,012,279	24,018,261	814,324	73,696,241	1,826,603

[a] Includes herring from Newfoundland, 4,049,011 pounds frozen, value, $142,659, and 7,223,224 pounds salted, value, $183,344.

The principal source of supply for the large quantities of fish landed by American fishing vessels at Boston and Gloucester, Mass., and Portland, Me., is the fishing grounds lying off the coast of the United States. In the calendar year 1916, 72.10 per cent of the quantity and 72.96 per cent of the value of the catch landed by the American fishing fleet at these three ports were taken from these grounds. Of the remainder, 9.06 per cent of the quantity and 9.34 per cent of the value were taken from fishing banks off the coast of Newfoundland, 18.80 per cent of the quantity and 17.61 per cent of the value from grounds off the Canadian Provinces, and less than 1 per cent of both the quantity and value from the coast of Labrador. Herring from Newfoundland constituted 6.06 per cent of the quantity and 5.10 per cent of the value of the fishery products landed at these ports during the year. The herring were taken on the treaty coasts of Newfoundland, but cod and other species from that region were obtained chiefly from fishing banks on the high seas. All fish caught by American fishing vessels off the Canadian Provinces were from offshore fishing grounds. The catch for each of these regions is given in detail in the following table:

QUANTITY AND VALUE OF FISH LANDED BY AMERICAN FISHING VESSELS AT BOSTON AND GLOUCESTER, MASS., AND PORTLAND, ME., IN 1916, FROM GROUNDS OFF THE COAST OF THE UNITED STATES, NEWFOUNDLAND, AND CANADIAN PROVINCES.

Species.	United States.		Newfoundland.[a]		Canadian Provinces.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Cod:								
Fresh	22,358,873	$869,105	827,672	$21,114	12,806,544	$328,350	35,993,089	$1,218,569
Salted	603,219	29,724	3,021,449	129,726	4,004,775	178,863	7,629,473	338,313
Haddock:								
Fresh	49,843,838	1,488,572	105,265	1,504	10,422,393	267,306	60,371,496	1,757,382
Salted	19,829	668	110,639	2,534	53,828	1,091	184,296	4,293
Hake:								
Fresh	10,520,206	287,772	265,974	4,403	2,242,911	42,121	13,029,091	334,296
Salted	5,356	130	64,290	1,349	73,562	1,465	143,208	2,944
Pollock:								
Fresh	15,125,113	374,361	5,350	73	372,024	7,144	15,502,487	381,578
Salted	57,295	1,133	17,840	388	26,008	517	101,143	2,038
Cusk:								
Fresh	4,428,815	92,539	51,765	860	1,535,947	25,016	6,016,527	118,415
Salted	26,349	378	7,545	175	17,876	482	51,770	1,035
Halibut:								
Fresh	896,724	117,509	1,084,749	107,110	1,382,048	152,456	3,363,521	377,075
Salted	315	26	66,649	6,212	28,280	2,272	95,244	8,510
Mackerel:								
Fresh	9,740,800	579,076			1,090,831	48,463	10,831,631	627,539
Salted	4,433,718	377,848			641,000	43,901	5,074,718	421,749
Herring:								
Fresh	7,360,705	66,641	4,049,011	142,659	300	5	11,410,016	209,305
Salted			7,223,224	183,344			7,223,224	183,344
Swordfish:								
Fresh	1,647,908	217,867	735	74	123,669	20,338	1,772,312	238,279
Tilefish:								
Fresh	873,142	24,295					873,142	24,295
Miscellaneous:								
Fresh	6,042,215	130,220	360	22	115,422	4,703	6,157,997	134,945
Salted	40	2					40	2
Total	133,984,490	4,657,866	16,902,517	601,547	34,937,418	1,124,493	185,824,425	6,383,906

[a] Includes 13,210 pounds of salted cod, valued at $576, and 42,975 pounds of salted halibut, valued at $4,449, from the Labrador coast.

Cod.—In 1916 there were 19 vessels employed in the salt bank fishery and 96 in the market fishery landing their fares at Boston, Gloucester, and Portland. Considerable quantities of cod were brought in also by vessels operating on the shore grounds. The total

quantity of cod landed was 43,622,562 pounds, valued at $1,556,882, of which 35,993,089 pounds, valued at $1,218,569 were fresh, and 7,629,473 pounds, valued at $338,313, were salted.

Haddock.—The haddock is the most important of the fishes taken in these fisheries. The quantity landed was 60,555,792 pounds, valued at $1,761,675, nearly all in a fresh condition, only 184,296 pounds, valued at $4,293, being salted.

Hake.—The year's yield of hake amounted to 13,172,299 pounds, valued at $337,240. The entire catch was landed fresh with the exception of 143,208 pounds, valued at $2,944, which were salted.

Pollock.—The pollock fishery was in a prosperous condition in 1916, and the catch landed at Boston and Gloucester exceeded that of the previous year by 791,577 pounds in quantity and $93,234 in value. The total yield for Boston, Gloucester, and Portland was 15,603,630 pounds, valued at $383,616. This quantity was landed fresh except 101,143 pounds, valued at $2,038, which were salted.

Cusk.—The catch of cusk was 6,068,297 pounds, valued at $119,-450, of which 51,770 pounds, valued at $1,035, were salted.

Halibut.—The halibut fishery on the Atlantic has varied but little during the past few years. The catch in 1916 was 3,458,765 pounds, valued at $385,585, all of which was landed fresh except 95,244 pounds, valued at $8,510, salted. The quantity landed at Boston and Gloucester declined from 3,870,685 pounds in 1915 to 2,923,451 pounds in 1916, but in the latter year there was an increase of $4,627 in the value.

Mackerel.—There is reason to believe that the abundance of mackerel is increasing, and there is no reason why the large catches of former years may not be repeated. The yield of fresh mackerel by the American fleet in 1916 was 102,420 barrels, compared with 71,564 barrels the previous year, an increase of 30,856 barrels. The output of salted mackerel was 19,554 barrels, compared with 19,691 barrels the previous year, a decrease of 137 barrels. The quantity landed at Boston, Gloucester, and Portland during the year was 15,906,349 pounds, valued at $1,049,288, of which 10,831,631 pounds, valued at $627,539, were fresh, and 5,074,718 pounds, valued at $421,749, were salted.

In 1917 up to June 30 the catch of fresh mackerel was 38,947 barrels and of salted mackerel 7,131 barrels, as against 43,169 barrels fresh and 4,468 barrels salted for the previous year to the same date. The mackerel fishery in the spring of 1917 was interrupted owing to a strike among the fishermen at the beginning of the season. The seining fleet was delayed in sailing, and the season was a failure so far as the seiners were concerned. The gill netters had a very successful season, and the fishermen made the largest shares for many years. During the season of six weeks some of the fishermen shared $1,000 each, and a considerable number shared $500 each. The fleet numbered about 30 sail of seiners in the south and about 125 sail of netters, about the same number as in the previous season. The fish taken were of mixed sizes, weighing from about $1\frac{3}{4}$ to $3\frac{1}{2}$ pounds each, and brought from 8 to 14 cents a pound, according to market conditions. Up to the latter part of May the catch was only about one-third that of the previous season. The first fare of mackerel of the season of 1917, amounting to 5 barrels, was landed

April 25 at Atlantic City, N. J.; these fish weighed 1¾ pounds each and sold in New York at 22 cents a pound. The Cape Shore fleet numbered about 32 sail, or about 8 more than in the previous year. These vessels were very successful, and more vessels than ever before made second trips, and one vessel made three trips.

Swordfish.—The catch of swordfish landed at Boston, Gloucester, and Portland amounted to 1,772,312 pounds, valued at $238,279. The swordfish fleet was not so large as in the previous year, and the receipts at Boston and Gloucester declined 483,345 pounds in quantity but increased $14,743 in value.

FISHERIES OF THE PACIFIC COAST STATES.

The Bureau has completed a canvass of the commercial fisheries of the Pacific Coast States for the calendar year 1915, and a bulletin embodying the results of the canvass has been prepared for distribution to the trade. The statistical agents of the Bureau visited every fishing community and obtained data by personal interviews with fishermen and fish handlers and by personal examination of all available records. The last general canvass of the fisheries of this region was made by the Bureau in 1904.

The number of persons engaged in the fisheries of these States was found to be 28,936; the investment in vessels, boats, fishing apparatus, shore and accessory property, and cash capital amounted to $24,025,172; and the products aggregated 286,204,558 pounds, with a value to the fishermen of $9,300,672. Washington ranks first among these States in the extent of its fisheries. In 1915, this State had 14,609 persons employed, an investment of $14,133,908, and products amounting to 158,983,478 pounds, valued at $5,317,080. California ranked second with 8,457 persons employed, an investment of $5,827,113, and products of 92,513,457 pounds, valued at $2,488,098. In Oregon the number of persons employed was 5,870, the investment $4,064,151, and the products aggregated 34,707,623 pounds, valued at $1,495,494.

The pack of canned salmon in the three States aggregated 1,961,026 cases, valued at $9,298,566; the pack of canned tuna, all of which is put up in California, aggregated 258,427 cases, valued at $1,517,858, and other canned articles amounted in value to $858,907; a total of $11,675,331.

The species taken in largest quantities were albacore or tuna, 21,049,190 pounds, valued at $316,103; cod, 10,487,401 pounds, valued at $343,338; halibut, 40,825,874 pounds, valued at $2,050,709; and salmon, 131,128,934 pounds, valued at $4,089,865.

Compared with the returns for 1904, there has been a very large increase in the fisheries of these States. The number of persons employed has increased 9,278, or 47.19 per cent; the investment $11,185,223, or 87.11 per cent; and the output 117,604,882 pounds, or 69.75 per cent, in quantity, and $2,619,806, or 39.21 per cent, in value. Statistics of the fisheries, including the quantity and value of canned products, of the Pacific Coast States in 1915, and comparative statistics of products for various years from 1888 to 1915, are given in the following tables:

STATISTICS OF THE FISHERIES OF THE PACIFIC COAST STATES IN 1915.

PERSONS, VESSELS, AND EQUIPMENT ENGAGED.

	Washington.		Oregon.		California.		Total.	
	Number.	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
Persons engaged	14,609		5,870		8,457		28,936	
Vessels fishing	472	$2,194,660	6	$22,650	73	$354,375	551	$2,571,685
Tonnage	11,363		74		3,198		14,635	
Outfit		578,825		3,285		52,791		634,901
Vessels transporting	140	689,248	30	84,184	18	66,500	188	839,932
Tonnage	2,213		267		184		2,664	
Outfit		68,895		11,850		5,510		86,255
Scows (5 tons and over)	297	142,660			2	5,500	299	148,160
Tonnage	7,258				146		7,404	
Boats:								
Power	1,565	644,755	1,382	582,485	1,430	1,353,110	4,377	2,580,350
Sail, row, etc	2,631	98,015	1,264	69,805	1,187	105,216	5,082	273,036
Seines	574	280,020	75	35,125	154	28,035	803	343,180
Gill nets	2,883	309,309	3,877	582,740	4,103	417,846	10,863	1,309,895
Pound nets	444	1,100,103	39	22,700			483	1,122,803
Trammel nets					2,320	59,400	2,320	59,400
Paranzella nets					44	9,000	44	9,000
Lampara nets					65	29,500	65	29,500
Hoop nets	2,487	7,497	680	995	4,860	13,585	8,027	22,077
Dip nets	67	134			11	64	78	198
Reef nets	8	425					8	425
Fyke nets					2,485	21,640	2,485	21,640
Bag nets					70	2,000	70	2,000
Lines		68,000		2,443		12,407		82,850
Beam trawls	21	1,815			9	400	30	2,215
Wheels	2	1,000	27	107,800			29	108,800
Pots and traps	4,945	8,477	5,768	4,828	4,307	9,437	15,020	22,742
Dredges, tongs, rakes, etc		4,811		539		1,620		6,970
Abalone outfit						2,460		2,460
Whaling apparatus		2,050						2,050
Shore and accessory property		7,386,709		2,083,913		2,731,390		12,202,012
Cash capital		546,500		448,809		545,327		1,540,636
Total		14,133,908		4,064,151		5,827,113		24,025,172

STATISTICS OF THE FISHERIES OF THE PACIFIC COAST STATES IN 1915—Continued.

FRESH AND SALTED PRODUCTS, ETC.

	Washington.		Oregon.		California.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Albacore (or tuna):								
Fresh					a 21,024,190	$315,622	21,024,190	$315,622
Salted					25,000	481	25,000	481
Anchovies:								
Fresh					81,385	1,730	81,385	1,730
Salted					16,000	1,600	16,000	1,600
Barracuda:								
Fresh					3,262,646	111,690	3,262,646	111,690
Salted					330,000	13,180	330,000	13,180
Bonito					448,256	12,622	448,256	12,622
Carp	200,000	$4,000	50,000	$750	350,815	6,366	600,815	11,116
Catfish					517,054	24,299	517,054	24,299
Cod:								
Fresh	22,025	421	14,400	288			36,425	709
Salted	5,498,284	180,934			4,952,692	161,695	10,450,976	342,629
Croakers					3,150	65	3,150	65
Flounders:								
Fresh	23,255	586	1,965	40	6,914,063	209,291	6,939,283	209,917
Salted					9,500	475	9,500	475
Grayfish	7,093,996	15,959					7,093,996	15,959
Hake:								
Fresh					221,252	1,937	221,252	1,937
Salted					24,000	960	24,000	960
Halibut	40,590,705	2,041,279	235,169	9.430			40,825,874	2,050,709
Hardhead					73,423	3,622	73,423	3,622
Herring:								
Fresh	2,129,149	9,655	12,500	383	764,384	7,116	2,906,033	17,154
Salted					50,000	1,000	50,000	1,000
Jewfish:								
Fresh					116,461	1,859	116,461	1,859
Salted					138,000	5,020	138,000	5,020
Kingfish					656,003	17,362	656,003	17,362
"Lingcod":								
Fresh	837,110	2,812	12,870	354	570,860	14,687	1,420,840	17,853
Salted					3,500	175	3,500	175
Mackerel:								
Fresh					253,899	6,668	253,899	6,668
Salted					6,450	259	6,450	259
Mullet					3,000	300	3,000	300
Perch	14,750	493	11,930	360	216,785	6,057	243,465	6,910
Pike, Sacramento					15,884	449	15,884	449
Pompano					19,350	2,032	19,350	2,032

Rock bass:								
Fresh					895,284	24,110	895,284	24,110
Salted					2,750	97	2,750	97
Rockfish:								
Fresh	99,651	2,915	12,000	445	4,336,254	145,816	4,447,905	149,176
Salted					8,000	400	8,000	400
Sablefish	575,810	13,782	15,520	388	64,503	1,359	655,833	15,529
Salmon:								
Blueback	5,043,374	345,710	337,027	16,848			5,380,401	362,558
Chinook—								
Fresh	18,188,160	699,771	23,497,052	1,225,393	6,640,933	324,082	48,326,145	2,249,246
Salted					20,000	2,400	20,000	2,400
Chum	17,156,224	282,517	1,981,879	11,081	b 38,093	190	19,176,196	293,788
Humpback	29,998,291	367,521					29,998,291	367,521
Silver	18,630,302	543,241	4,844,844	94,140	240,351	8,962	23,715,497	646,343
Steelhead	2,114,141	91,389	2,365,858	75,332	32,405	1,288	4,512,404	168,009
Sardines:								
Fresh					4,387,706	27,651	4,387,706	27,651
Salted					1,400	80	1,400	80
Sculpin					8,813	345	8,813	345
Sea bass			2,000	60	1,221,262	49,381	1,223,262	49,441
Sea trout					6,083	213	6,083	213
Shad:								
Fresh	96,298	1,164	488,625	4,945	6,846,008	66,982	7,430,931	73,091
Salted					10,000	125	10,000	125
Roe					27,033	2,491	27,033	2,491
Sharks	399,000	889			67,972	236	466,972	1,125
Skates	229,000	515			177,650	868	406,650	1,383
Smelts	2,158,371	25,333	3,500	175	1,137,072	52,978	3,298,943	78,486
Sole	32,062	951			5,761,929	108,254	5,793,991	109,205
Spanish mackerel					396,905	11,555	396,905	11,555
Split-tails					17,016	384	17,016	384
Stingray					605,000	1,512	605,000	1,512
Striped bass					1,784,448	146,928	1,784,448	146,928
Sturgeon	43,656	2,151	97,785	5,014	16,924	987	158,365	8,152
Strugeon roe					1,275	708	1,275	708
Sturgeon caviar	300	75					300	75
Surffish					127,500	7,255	127,500	7,255
Tomcod			22,500	900	41,912	939	64,412	1,839
Whitebait					56,250	2,250	56,250	2,250
Yellowtail:								
Fresh					1,094,416	26,123	1,094,416	26,123
Salted					124,500	4,743	124,500	4,743
Miscellaneous fishes					17,232	539	17,232	539
Abalone:								
Alive					24,026	517	24,026	517
Meat					730,974	16,830	730,974	16,830
Shells					74,000	1,890	74,000	1,890
Pearls and blisters						1,240		1,240

a Includes 5.131 pounds of yellowfin, valued at $145.

b Taken in Columbia River by California fishermen.

STATISTICS OF THE FISHERIES OF THE PACIFIC COAST STATES IN 1915—Continued.

FRESH AND SALTED PRODUCTS, ETC.—Continued.

	Washington.		Oregon.		California.		Total.	
	Number.	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*	*Number.*	*Value.*
Clams:								
Hard	175,744	$12,191			a 65,856	$17,583	241,600	$29,774
Soft	1,200	150	22,460	$3,041	67,160	18,107	90,820	21,298
Razor	372,750	56,446	77,200	10,900			449,950	67,346
Mussels	700	83			19,240	2,326	19,940	2,409
Oysters:								
Eastern, market	265,013	140,028			375,774	165,573	640,787	305,601
Native—								
Market	450,394	250,298	1,547	725	8,435	6,513	460,376	257,536
Seed	24,808	b 8,619					24,808	8,619
Octopus					32,309	2,717	32,309	2,717
Squid	15,000	325			6,211,325	32,626	6,226,325	32,951
Crabs	1,734,410	54,526	415,272	13,755	1,414,155	128,434	3,563,837	196,715
Crawfish			183,720	20,747	550	265	184,270	21,012
Spiny lobsters					892,392	130,119	892,392	130,119
Shrimp	386,420	18,719			298,000	5,550	684,420	24,269
Turtle					206	13	206	13
Whale oil	2,635,125	112,851					2,635,125	112,851
Whalebone	6,000	4,200					6,000	4,200
Other whale products	1,292,000	24,390					1,292,000	24,390
Sea lion					9,375	4,120	9,375	4,120
Kelp	450,000	191			5,000,000	2,500	5,450,000	2,691
Other seaweeds					6,799	325	6,799	325
Total	158,983,478	5,317,080	34,707,623	1,495,494	92,513,457	2,488,098	286,204,558	9,300,672

COMPARATIVE YIELD OF FRESH AND SALTED PRODUCTS IN YEARS SPECIFIED.[c]

	Washington		Oregon		California		Total	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
1888	23,400,292	$890,860	25,169,266	$1,010,843	23,313,324	$1,091,398	71,882,882	$2,993,101
1892	36,757,287	931,568	28,521,105	872,405	57,838,466	3,022,991	123,116,858	4,826,964
1895	59,079,527	1,401,433	38,141,632	1,282,036	50,010,020	1,786,483	147,231,179	4,469,952
1899	121,630,226	2,884,908	23,245,501	862,880	74,462,089	2,568,383	219,337,816	6,316,171
1904	88,954,790	2,972,633	27,535,232	1,185,092	52,109,654	2,523,141	168,599,676	6,680,866
1908	100,456,000	3,513,000	28,217,000	1,356,000	47,477,000	1,970,000	176,150,000	6,839,000
1915	158,983,478	5,317,080	34,707,623	1,495,494	92,513,457	2,488,098	286,204,558	9,300,672

MOLLUSKS AND WHALE OIL, IN BUSHELS AND GALLONS.

	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Clams:								
Hard .... bushels..	21,968	$12,191	....	....	8,232	$17,583	30,200	$29,774
Soft .... do....	120	150	2,246	$3,041	6,716	18,107	9,082	21,298
Razor .... do....	37,275	56,446	7,720	10,900	....	....	44,995	67,346
Oysters:								
Eastern, market .... do....	37,859	140,028	....	....	53,682	165,573	91,541	305,601
Native—								
Market .... do....	64,342	250,298	221	725	1,205	6,513	65,768	257,536
Seed .... do....	3,544	8,619	....	....	....	....	3,544	8,619
Mussels .... do....	70	83	....	....	1,924	2,326	1,994	2,409
Whale oil .... gallons..	351,350	112,851	....	....	....	....	351,350	112,851

CANNED PRODUCTS.[d]

	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
Albacore (tuna) .... cases..	....	....	....	....	258,427	$1,517,858	258,427	$1,517,858
Bonito .... do....	....	....	....	....	2,551	16,586	2,551	16,586
Salmon:								
Blueback .... do....	91,720	$932,394	4,510	$24,915	....	....	96,230	957,309
Chinook .... do....	[e]178,464	1,400,220	292,765	2,246,574	19,508	109,391	490,737	3,756,185
Chum .... do....	450,409	1,219,061	40,728	104,698	....	....	491,137	1,323,759
Humpback .... do....	[f]590,378	1,772,565	....	....	....	....	590,378	1,772,565
Silver .... do....	206,508	1,036,859	53,405	258,038	3,578	16,391	263,491	1,311,288
Steelhead .... do....	10,270	64,860	18,783	112,600	....	....	29,053	177,460
Yellowtail .... do....	....	....	....	....	1,642	11,409	1,642	11,409
Clams .... do....	49,337	211,008	9,542	39,699	....	....	58,879	250,707
Not cooked .... gallons..	7,505	4,066	....	....	....	....	7,505	4,066
Clam juice .... cases..	270	1,050	225	810	....	....	495	1,860
Not cooked .... gallons..	4,944	2,427	....	....	....	....	4,944	2,427
Oysters, not cooked .... do....	49,103	120,513	....	....	29,400	75,804	78,503	196,317
Miscellaneous .... cases..	....	....	252	3,169	65,387	372,366	[g]65,639	375,535
Total	....	6,765,023	....	2,790,503	....	2,119,805	....	11,675,331

[a] Includes 640 pounds of cockles, valued at $164.
[b] Value estimated.
[c] The statistics for 1908 in this table are from data published by the Bureau of the Census.
[d] All products except clams and clam juice, which have no uniform weight, represent 48 pounds to the case.
[e] Includes 553 cases smoked before canning.
[f] Includes 656 cases smoked before canning.
[g] Includes shad, 9,906 cases, valued at $29,575; shad roe, 6,563 cases, valued at $80,362; and 49,170 cases sardines, abalone, crabs, rockfish, and mussels, valued at $265,598.

VESSEL FISHERIES AT SEATTLE, WASH.

Statistics of the vessel fisheries at Seattle, Wash., have been collected by the local agent and published as monthly and annual bulletins giving the quantity and value of fishery products landed by American fishing vessels at that port.

In 1916 there were landed at Seattle by American fishing vessels 517 trips aggregating 17,411,435 pounds of fish, having a value to the fishermen of $1,361,233. These fish were taken from the fishing grounds along the coast from off the Columbia River northward to Portlock Bank, Alaska. The products included 15,317,992 pounds of halibut, valued at $1,306,645; 2,039,200 pounds of sablefish, or black cod, valued at $53,438; and 54,243 pounds of other species, valued at $1,150.

The fishery products taken in Puget Sound and landed at Seattle by collecting vessels amounted to 10,137,387 pounds, valued at $471,259. These products included 8,141,682 pounds of salmon, valued at $427,812; 1,425,989 pounds of herring, valued at $9,028; 149,214 pounds of steelhead, valued at $12,405; 61,957 pounds of salmon trout, valued at $5,201; 41,274 pounds of smelt, valued at $2,130; 59,487 pounds of flounders, valued at $1,025; 47,071 pounds of sole, valued at $1,164; 127,388 pounds of crabs, valued at $8,890; and a number of other species in smaller quantities. The quantity and value of fishery products landed at Seattle by fishing and collecting vessels in 1916 are given in detail in the following tables:

QUANTITIES AND VALUES OF CERTAIN FRESH FISHERY PRODUCTS LANDED AT SEATTLE, WASH., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1916.

BY FISHING GROUNDS.

	Number of trips.	Halibut.		Cod.		Sablefish (black cod).		"Lingcod."		Red rockfish.		Total.	
		Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Columbia River grounds	28	986,692	$86,656			174,255	$4,073	3,455	$69			1,164,402	$90,798
Grays Harbor grounds	19	477,000	42,703			547,955	15,884					1,024,955	58,587
Flattery Banks	254	2,773,628	241,956	60	$1	878,117	22,930	3,158	59	14,843	$349	3,669,806	265,295
West coast, Vancouver Island	24	474,000	50,441			65,000	1,700					539,000	52,141
Hecate Strait	91	2,912,513	259,131			140,430	3,623	8,113	142	6,565	132	3,067,621	263,028
Forrester Island	2	61,804	5,581			15,286	382			1,342	27	78,432	5,990
Coronation Island	16	334,003	33,063									334,003	33,063
Cape Ommaney	3	165,679	10,607			17,371	444	1,530	30	3,117	70	187,697	11,151
Cape Spencer	1	10,000	1,250									10,000	1,250
Fairweather grounds	4	256,786	22,758			1,350	29					258,136	22,787
Yakutat grounds	51	4,185,533	341,730			127,551	2,819	305	6	2,400	80	4,315,789	344,635
Yakataga grounds	1	136,077	10,908									136,077	10,908
Middleton Island grounds	3	363,225	22,626									363,225	22,626
Portlock Bank	20	2,181,052	177,235	324	6	71,885	1,554	8,900	178	131	1	2,262,292	178,974
Total	517	15,317,992	1,306,645	384	7	2,039,200	53,438	25,461	484	28,398	659	17,411,435	1,361,233

BY MONTHS.

	Number of trips.	Halibut.		Cod.		Sablefish (black cod).		"Lingcod."		Red rockfish.		Total.	
		Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
January	8	923,055	$68,049			18,000	$360					941,055	$68,409
February	7	706,931	47,669			16,232	443					723,163	48,112
March	31	815,209	82,226	60	$1	16,175	484					831,444	82,711
April	61	1,207,372	130,438			10,566	318	6,006	$120	11,413	$293	1,235,357	131,169
May	89	2,024,105	129,672			84,955	2,124					2,109,060	131,796
June	78	1,714,712	150,893			200,233	4,883	11,732	230	5,990	123	1,932,667	156,129
July	59	1,787,358	145,804			119,910	3,094	6,748	115	9,565	207	1,923,581	149,220
August	41	1,395,395	106,509	324	6	109,100	2,737	670	13	1,430	36	1,506,919	109,301
September	61	2,132,730	187,142			662,740	19,248	305	6			2,795,775	206,396
October	51	1,327,948	129,325			704,000	17,682					2,031,948	147,007
November	17	711,667	74,101			66,024	1,363					777,691	75,464
December	14	571,510	54,817			31,265	702					602,775	55,519
Total	517	15,317,992	1,306,645	384	7	2,039,200	53,438	25,461	484	28,398	659	17,411,435	1,361,233

FISHERY PRODUCTS, BY MONTHS, TAKEN IN PUGET SOUND AND LANDED AT SEATTLE, WASH., BY COLLECTING VESSELS DURING 1916.

Species.	January.		February.		March.		April.		May.		June.		July.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Sturgeon									304	$15	1,712	$87	1,626	$81
Herring	34,200	$171	169,900	$751	754,600	$5,737	10,000	$50	452,400	2,262	2,045	20	844	17
Salmon:														
Chum or keta	4,000	200												
King or spring							11,170	1,117	198,780	14,654	561,544	42,116	688,883	41,333
Coho or silver											43,490	3,236	34,493	2,070
Sockeye or red							493	49	16,742	1,296	26,576	1,993	28,665	1,720
Trout:														
Steelhead	16,962	1,557	14,011	1,243	4,311	366	17,400	1,740	34,023	2,730	17,698	1,416	7,675	461
Salmon							6,070	486	18,182	1,548	5,290	529	6,130	613
Smelt	350	10	59	2							560	11	1,360	68
Perch							2,000	100	850	26	2,385	48	3,680	110
Red rockfish											675	14	545	12
"Lingcod"			275	3					1,492	19	500	10	450	9
Tomcod							1,400	35						
Flounders	784	12	512	7	850	17	1,800	45	9,382	164	13,084	199	13,030	261
Sole					1,060	32	2,400	72	7,450	186	5,535	137	6,270	187
Other fish			614	8							2,075	104	5,200	208
Crabs	3,384	338	9,240	462	26,456	2,070	38,390	2,617	25,608	1,746	24,310	1,657		
Shrimp									1,800	180	4,500	450		
Total	59,680	2,288	194,611	2,476	787,277	8,222	91,123	6,311	767,013	24,826	711,979	52,027	798,851	47,150

Species.	August.		September.		October.		November.		December.		Total.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*	*Pounds.*	*Value.*
Sturgeon	2,104	$105	5,200	$312	2,545	$102					13,491	$702
Herring	2,000	20									1,425,989	9,028
Salmon:												
Humpback or pink	3,000	65									3,000	65
Chum or keta	127,340	5,094	163,200	11,424	2,035,613	61,068	746,000	$33,570	502,760	$27,652	3,578,913	139,008
King or spring	753,142	45,189	428,870	30,020	31,512	1,733	34,450	2,067	6,500	488	2,714,851	178,717
Coho or silver	156,099	8,805	481,490	33,704	905,260	49,789	129,000	7,115	375	23	1,750,207	104,742
Sockeye or red	22,235	222									94,711	5,280
Trout:												
Steelhead	7,959	489	6,200	434	1,625	98	4,500	270	16,850	1,601	149,214	12,405
Salmon	15,110	907	7,840	784	1,105	111	2,230	223			61,957	5,201
Smelt	8,240	347	13,950	837	8,755	525	3,000	180	5,000	150	41,274	2,130
Perch	1,959	59	3,430	137	1,745	70			200	8	16,249	558
Red rockfish	4,470	224	8,605	485	1,480	74	1,575	78	2,000	100	19,350	987
"Lingcod"	835	18	1,450	29					10,000	150	15,002	238

Sablefish (black cod)									800	20	800	20
Tomcod											1,400	35
Flounders	8,030	80	4,150	83	3,965	79	2,700	54	1,200	24	59,487	1,025
Sole	7,340	147	5,280	106	1,600	32	5,056	151	5,080	114	47,071	1,164
Other fish	2,844	114									10,733	434
Crabs											a 127,388	8,890
Shrimp											6,300	630
Total	1,122,707	61,885	1,129,665	78,355	2,995,205	113,681	928,511	43,708	550,765	30,330	10,137,387	471,259

a 5,929 dozen.

PRESERVATION AND UTILIZATION OF FISHERY PRODUCTS.

One of the most important services the Bureau can render is to send trained experts to the fishing centers to instruct those desirous of preserving fish by methods new to them, to ascertain by experiment the adaptability of various fishery products to untried methods of preservation of these products, to increase the utilization of waste fish and fish waste, to encourage the adoption of methods which will improve the character of the pack and discourage the use of methods which produce an unsatisfactory pack, to study and attempt to solve obstructive difficulties with which the fishermen are contending, to furnish advice relative to equipment needed and information as to where it may be obtained; in fact, to serve as efficiency experts to the fishery interests.

Although handicapped by lack of adequate provision for work of this character and inability to employ men with the desired basic training because of lack of funds, it has rendered important service to cannery men and others connected with the fisheries in the Middle Atlantic and New England States. There is a pressing demand for work of similar character in the South Atlantic and Gulf States, in the Pacific Coast States, and in the Great Lakes and Mississippi Valley region.

The diversion of some of the menhaden vessels to Government use, thereby diminishing the size of the fleet engaged in catching menhaden for fertilizer; the diversion of large amounts of tankage from the packing houses for hog feed, thereby reducing the sources of supply of ammoniates; the general scarcity of fertilizing materials; and the costliness of feed for poultry and stock, afford a very unusual opportunity for increasing the utilization of fish offal into oil, fertilizer, and fish meal. The amount of unutilized offal is very great. The Bureau has urged the fishermen to install conversion machinery and use this waste, in order to alleviate the shortages of oil, scrap, and meal, and has furnished information relative to machinery needed, etc.

Experiments have been made in the preservation of drum, sea robin, sharks, whiting, menhaden, river herring, bowfin, the milt roe of fishes, and various other neglected or little utilized products by untried methods of preservation, to ascertain the methods best adapted to the preservation of those products for market.

The methods of smoking and cooking smoked fresh-water fishes of various species have been described in circulars prepared and published for wide distribution. Active campaigns of demonstration and instruction were begun before the close of the fiscal year, with the promise of immediate practical results in the increased utilization of the "coarse" fishes.

CURING ALEWIVES IN THE CHESAPEAKE BASIN.

Coincident with the decreased run of alewives, or river herring, in Chesapeake Bay and tributaries, the value of the fish has increased markedly. The methods of preserving the catch are, however, very wasteful. This is due in part to uneconomical methods of cutting the fish, to the custom of selling the fish by count instead of by weight, to the failure to fully utilize the roe, to lack of knowledge of

proper methods for canning the fish, and to failure to utilize the milt roe for food and more of the fish offal for fertilizer. At present the fish are marketed fresh, smoked, salted, and canned. Some of the roe is canned. The pickled fish are usually prepared in one of three ways, known as "cut" fish, "gross," and "selected roes."

The Bureau has recently been making a study of the industry in this region for the purpose of securing closer cooperation among the fishery interests so as to improve conditions, to give new methods of preserving the various products a trial, and to develop uses and markets for neglected products. By way of experiment, some of the fish were cured after the Scotch method and some of the milt roe was canned. From an analysis of the latter and tests as to the methods of preparation for the table, it appears that this will make a good food product.

The following method of canning alewives has proved quite satisfactory. The fish are cut, washed, and placed in the salting vats in the same manner as if intended for salt curing. After 12 to 14 hours they are removed from the vats and washed in an abundance of luke-warm fresh water. During the washing, they are trimmed, the balance of the fins and scales being removed. They are then cut to can size and placed in the cans, after which they are processed for 55 minutes at 244° F. for No. 1 cans and 60 minutes for No. 2 cans.

Herring roe intended for canning is collected in buckets as the fish are cut and washed in fresh water in special trays, blood and adhering particles of entrails being removed. The roe is then put in the cans. As it swells considerably in processing, the cans must not be entirely filled. If of the sanitary type, the cans are filled to within about three-fourths of an inch of the top with roe and then filled to the edge with cold salt brine, about 1 pound of salt to 8 or 10 gallons of water being used to make the brine. The brine is added solely for seasoning. The cans are immediately capped and placed in the processing baskets. If solder-top cans are used, the filled cans are placed in the exhaust box. Upon removal from the exhaust, the necessary air space is provided for by pressing the roe down with a plunger. Material clinging to the groove where the solder is to be applied is removed with a brush and the cans are capped and tipped. The canned roe is processed in a closed kettle for 45 to 55 minutes at a temperature of 240 to 245° F. The milt roe may be canned in the same manner as the roe except that the cans can be more completely filled, as this product does not swell in processing. As the quantity of brine used in this case will be somewhat less, it should be made correspondingly stronger.

EXPLOITATION OF NEGLECTED AQUATIC FOODS.

The Bureau has continued its active campaign in behalf of neglected products, more particularly those suitable for food, and has scored further successes in this important field.

The history of the establishment of the tilefish fishery was referred to at length in the last annual report, in which it was shown that to the end of the fiscal year 1916, when the fishery had been in existence only 8 months, there had been caught over 4,388,500 pounds of tilefish, for which the fishermen received more than $210,000. By

the end of the first 12 months, the known catch was upward of 10,250,000 pounds, valued at more than $400,000. During the fiscal year 1917, the landings aggregated 11,641,500 pounds, and the receipts of the fishermen exceeded $477,730. A feature of the fishery in that year was the increased receipts at Boston and the diminished receipts at New York, although New York, at the end of the year, continued to be the chief center of the business.

The campaign to make an asset out of one of the most destructive and neglected fishes of the Atlantic coast, namely, the spiny dogfish, has progressed rapidly and well, notwithstanding local opposition and a counter campaign of misrepresentation and ridicule among a limited number of people who had become committed to another and impracticable way of combatting the dogfish plague.

Among the first steps taken by the Bureau was to suggest a change in the name of the fish for trade purposes. The species has been generally known as dogfish, a name which is objectionable because of the prejudice against it and is not distinctive because it is shared by various other little-regarded marine and fresh-water fishes. People in all parts of the country will eat catfish but are opposed to dogfish. The name adopted was grayfish, which is descriptive, not preoccupied, and altogether unobjectionable.

Although the authority and the funds for carrying on this work were not granted by Congress until the latter part of June, 1916, midsummer found canners in Maine and Massachusetts making arrangements to pack grayfish, and packing actually began in August under an arrangement made with the Bureau by which the fish was to be prepared in a stipulated manner and sold at a price not to exceed a certain low figure, in return for which the label was permitted to state that the fish was packed in accordance with the recommendation of the Bureau of Fisheries. Another early development was the selling of a limited quantity of fresh fish in the New York market, with the indication that demand would increase.

The destructiveness of the grayfish and the extent to which it has interfered with established fisheries have caused the fishermen to look upon it with such aversion that it was only by the exercise of much persuasion that they could be induced to catch the fish or even to bring ashore those caught incidentally with apparatus set for other fishes. An early feature of the campaign was the complete change in the fishermen's attitude after they had become fully informed as to the Bureau's plans; and the autumn of 1916 witnessed the extraordinary sight of New England fishermen going out especially for grayfish and selling their catch at remunerative prices for food.

Although the canneries took all the grayfish they could obtain, when the fish withdrew from New England waters for the winter the season's pack was not as large as desired by the canners or contemplated by the Bureau in its publicity campaign, and in the marketing of the pack it soon became evident that the demand far surpassed the supply. The canned fish met with very ready sale, and long before the winter was over the entire pack was disposed of and orders continued to arrive from all parts of the country. The goods proved to be not only one of the best canned products on the market but also one of the most economical to the consumer, who could buy at retail for 10 cents a can containing 14 ounces net weight of fish.

The limited quantity of grayfish which the canners found it possible to pack on the Atlantic coast having become exhausted, arrangements were made in December for the inauguration of grayfish canning on Puget Sound, where the fish are found in numbers in winter as well as in summer. The salmon canneries of Washington are idle in winter, and the owners showed much interest in the project presented to them of being able to keep their plants open when they had formerly been unproductive. One cannery began operations almost immediately and by March, 1917, this had been joined by two or three others, while four or five others had announced their intention to experiment with the fish with the view of entering the business if the industrial conditions warranted it. The entire prospective pack of the first concern was contracted for, and it was stated that one packer had been obliged to refuse an order of 20,000 cases on account of the scarcity of cans. A number of orders for export were received but were declined by the canners in deference to the Bureau's desire first to satisfy the heavy domestic demand.

In the latter months of the fiscal year the demand for grayfish continued to increase. Although the canned product had been known to the trade and public only since October, in April, 1917, it was known to be handled by dealers in 128 cities and towns in New York and Pennsylvania alone, and by May the fish was on sale by retailers in 30 States and the District of Columbia.

With the return of grayfish to the coastal waters of New England in the spring of 1917, canning was resumed in Massachusetts, and there is every indication that the output for the calendar year will be greatly in excess of 1916 and that the fish will henceforth have a market for fishermen and packers.

The Office of Home Economics of the Department of Agriculture has conducted experiments in feeding canned grayfish to human beings, and has found that 92.8 per cent of the protein is digested as compared with 94.5 per cent in the highest grade of Columbia River salmon, 93.1 per cent in fresh mackerel, and 91.9 per cent in fresh butterfish. Ninety-five per cent of the fats in grayfish were digested as compared with 94.3 per cent in salmon, 95.4 per cent in mackerel, and 89.9 in butterfish.

Early in the fiscal year the Bureau opened negotiations with the fishery interests of Puget Sound regarding a campaign to increase the consumption of the so-called "black cod," a fish of excellent quality and high food value. In anticipation of the creation of a public demand, considerable quantities were placed in the freezers in Seattle and Tacoma during the summer and fall. The fish is not related to the cod family and in the interest of accuracy it was renamed sablefish, and it began to be exploited under that name in January, 1917. It immediately found a ready market and moved from the cold storage plants so rapidly that it was determined to defer a more vigorous propaganda until spring, when it could be caught in larger numbers. In April, display cards and other advertising matter were issued and its excellent qualities were called to the attention of the public through the newspaper and magazine press. As a result, upwards of 2,000,000 pounds of the frozen fish and 1,304,000 pounds in the fresh state were disposed of by the dealers by June 30, and reports at that time indicated that it was being landed in larger quantities by the fishermen of the Pacific Coast States and that a

considerable fishery was developing in Alaska. The sablefish is abundant along the entire Pacific coast north of San Francisco, and it is believed that it is destined to afford a very important food supply to the country.

A similar undertaking in respect to the burbot was inaugurated about the time of the opening of the Great Lakes fisheries in April. The burbot, which is a fresh-water member of the cod family, is an abundant fish of the large bodies of water of the northern part of the United States, and not only has been neglected as a food resource but on account of its predaceous habits is destructive of other food fishes. Effective cooperation was established with a number of the principal wholesale fish dealers at Great Lakes ports, and about 500,000 pounds of burbot were marketed by them between April 1 and June 30. This fish is generally sold skinned, eviscerated, and headless; and as the price is low it affords an economical food supply of good quality.

Experiments in smoking various species of fresh-water fish, begun at the Fairport station some two years ago, have yielded interesting results. The bowfin or grindle, which is usually regarded as practically worthless, has been found to yield a very superior product when properly smoked. Everyone who has sampled the product has testified to the excellent texture and flavor of the meat and some pronounce it the best of smoked fish. The bowfin is generally known through the Mississippi Basin as dogfish or grindle. It is an abundant form in the Great Lakes and in sluggish waters from Minnesota and New York to Florida and Texas. The proper utilization of this species will not only add another commercial product to the market but will tend to reduce the relative abundance of a species which is most predatory upon the other fishes that are more highly valued in the fresh state.

EXPLOITATION OF ALASKAN FISHERY RESOURCES.

An innovation in the Alaska field and a contribution to food preparedness has been the comprehensive campaign inaugurated by the Bureau to encourage the utilization of fishery products heretofore more or less neglected. At the same time attention has been directed particularly toward the packing of herring by the Scotch method, which heretofore has not been attempted in Alaska, all herring for food purposes having been preserved by the more simple Norwegian method. The Bureau secured the services of a recognized authority in the curing of Scotch herring and sent him to Alaska in the spring of 1917. Three special assistants, graduates of the fishery school of the University of Washington, were employed by the Bureau to accompany the expert and acquire all information possible in regard to the improved methods. Several of the regular employees of the Alaska service also were detailed to learn these new methods, so as to be able to instruct the fishermen.

Very gratifying results have followed this campaign, as the fishery interests have shown a marked interest and a desire to give practical effect to the Bureau's work. The herring fishery of Alaska has not been developed to anything like the extent of its possibilities, and as a result of the interest manifested by the trade it is probable that the product in 1917 will be more than double that of any previous season.

It is believed that at least 25,000 barrels of Scotch-cured herring will have been prepared in Alaska in 1917, this in addition to a substantial pack of herring prepared in the Norwegian style. The largest pack of Norwegian herring heretofore made in Alaska in any one year was approximately 18,000 barrels.

Efforts are being made by the Bureau's agents to develop the use of other species of fishes, particularly the sablefish and atkafish. The latter, improperly called atka mackerel, is excellent when salted like mackerel. It is abundant in parts of Alaska but is entirely unknown in the markets.

MARKETING CARP ALIVE.

The carp is generally marketed fresh, smoked, or alive, the principal markets being in the large cities in the East which have a foreign population. As a result of various inquiries regarding the feasibility of shipping carp alive from Pacific Coast States to New York City and other eastern points, the Bureau conducted a brief investigation of the methods employed in handling this product. Normally two carloads of carp are shipped each week into New York City, principally from Port Clinton or Sandusky, Ohio, occasionally from other points in the Great Lakes and upper Mississippi Valley region.

The fish are transferred from the nets to large live cars and towed to the shipping point or to retaining ponds to be held for shipment later. Those held in ponds are fed regularly on grain to fatten and harden them. At the point of shipment, the carp are transferred to tanks in the cars, which are usually old baggage cars. Each car is equipped with 8 to 10 galvanized-iron tanks arranged along the sides with a passageway about 2 feet wide running through the center. The space under the passageway serves to hold ice in which the fish which die in transit are iced.

The tanks are about 3 feet wide, 3 feet deep, and 8 to 10 feet long, heavily reinforced with strips of angle iron. A strip of metal about 8 inches wide extends inward from the upper edge to keep the water from sloshing out and the fish from jumping out. When the car is in motion the balance of the opening is covered with a solid cover. Running lengthwise along the bottom of the tanks are one-half-inch galvanized-iron pipes, perforated at intervals of about 4 inches along the upper side with very small, uniform-sized openings for aeration. A wire grating covers these pipes. When the car is stationary or moving slowly, air is passed through the pipes by a pump operated by a set of storage batteries, which are recharged while the car is in motion by a belt attached to the car axle. When the car is moving more rapidly, a floor pump, connected directly with the axle of the car furnishes the necessary power. In warm weather the air, before entering the tanks, is cooled by passing through a set of coils surrounded with ice. In transit the constant attention of a skilled attendant is required to care for machinery and fish.

The amount of fish which can be transported with reasonable safety depends upon prevailing conditions of temperature and distance, varying from about 8,000 to 20,000 pounds.

At the terminus, the fish are transferred to tanks on automobile trucks and delivered to the retailers, who have tanks with running

water for keeping the fish alive. In the live-carp trade, fish weighing from 2 to 3 pounds are preferred. In the fresh (dead) carp trade, fish weighing from 3 to 5 pounds, and for smoking still larger fish, are preferred.

DEVELOPMENT OF AQUATIC SOURCES OF LEATHER.

There is a growing scarcity of mammal hides used in the manufacture of leather. The fishermen have no established market for fishskins. A small demand for certain fishskins for special purposes exists, but difficulty is experienced by those using these products to get in touch with sources of supply. These facts have led the Bureau to investigate the possibilities of making satisfactory leathers from fishskins and establishing a market for these products. The tasks confronting it are to induce tanners to develop processes suitable for converting fishskins into high-grade leathers and thus create a market for the raw hides, to instruct the fishermen in preparing the hides properly for the tanner, to encourage them to save and market the skins, to ascertain to what uses the leathers are best suited, and to determine the extent and sources of demand for fishskins for other purposes.

The Bureau has distributed several hundred skins of sharks and other fishes, including cod, hake, grouper, gar, ray, catfish, and wolffish, among tanners for experimentation. A number of tanners are interested in the project and are developing processes capable of producing some very creditable leathers. The larger samples have been submitted to the Bureau of Standards for testing as to tensile strength. The average tensile strength of one of the shark skins examined was 3,479 pounds per square inch. Such data are being used for comparison with other leathers. Of the skins tanned, those of the various sharks are the most promising.

Present methods of skinning sharks are slow and tedious. Special instruments have been made and are being tried out for the purpose of overcoming these difficulties. Instructions have been furnished fishermen regarding the curing and packing of skins for shipment, and the names of tanners desirous of obtaining raw materials have been supplied.

Formerly large quantities of shark skins, cleaned but not tanned, were used for polishing wood, ivory, and the like. Because of the roughness, hardness, and durability of the outer surface, they were especially serviceable for this purpose. Although sandpaper and emery preparations have largely replaced such materials, there is still a small demand among cabinetmakers for certain of these hides. It remains to ascertain what hides are best suited to the needs of the various trades and arrange for supplies of these materials. In the past, shark-skin leathers have been used to a very limited extent for various ornamental and novelty purposes. The results of experiments recently made in the tanning of these skins indicate that they can be used on a commercial basis for bag, belt, and similar purposes, and this information is being brought to the attention of manufacturers of such articles. The Bureau is also endeavoring to ascertain whether an industry can be built up which will utilize the skins of smaller fishes, such as cod, hake, grouper, burbot, rays, catfish, etc., on a commercial basis. These and other problems have received

attention, and those obstructive to the development of the industry are being solved.

Congress passed an act, approved June 12, 1917, authorizing the Bureau to conduct a careful investigation in this field. This act carried an appropriation of $10,000 to enable the Bureau of Fisheries, in cooperation with the Bureau of Standards, to develop new aquatic sources of supply of leather.

PROPAGATION AND DISTRIBUTION OF FOOD FISHES.

GENERAL REVIEW OF OPERATIONS.

Conspicuous success and progress have characterized the year's work in fish culture. While the output of several of the important species was less than the average in recent years, the aggregate output was larger than in any previous year, the increase over 1916 being somewhat more than 6 per cent. Among the fishes produced in about the same numbers as in 1916 were shad, whitefish, silver salmon, chum salmon, rainbow trout, and brook trout. Species whose output was smaller were chinook salmon, sockeye salmon, grayling, smelt, black bass, pike perch, yellow perch, white perch, cod, and lobster. Increased production was secured in the case of catfish, buffalofish, silver salmon, humpback salmon, steelhead salmon, Atlantic salmon, landlocked salmon, lake trout, striped bass, pollock, and winter flounder. The somewhat detailed discussion which follows shows the reasons for the gains and losses in the different fields. The total output was 5,158,963,295, compared with 4,847,262,565 in 1916.

Following is a summarized table showing the number of fish eggs and fish distributed by the Bureau in the past year. Most of the eggs herein noted were transferred to various State hatcheries.

SUMMARY, BY SPECIES, OF THE DISTRIBUTION OF FISH AND FISH EGGS DURING THE FISCAL YEAR 1917.

Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Catfish			4,251,289	4,251,289
Carp		112,000	605,407	717,407
Buffalofish		6,754,000	207,898	6,961,898
Shad		77,946,000		77,946,000
River herring			177,000	177,000
Whitefish	52,602,500	331,610,000		384,212,500
Lake herring (cisco)		82,550,000		82,550,000
Blueback salmon	2,000,000	75,038,525	5,793,953	82,832,478
Chinook salmon	7,191,200	16,404,404	27,065,581	50,661,185
Chum salmon		14,403,300	7,014,580	21,417,880
Humpback salmon		27,406,204	7,449,030	34,855,234
Silver salmon		4,403,700	4,662,960	9,066,660
Steelhead salmon	3,237,600	2,040,710	2,061,709	7,340,019
Atlantic salmon		3,028,850	887	3,029,737
Landlocked salmon	531,000	798,689	177,635	1,507,324
Rainbow trout	1,454,200	250,200	2,574,942	4,279,342
Blackspotted trout	1,630,000	2,051,400	2,683,900	6,365,300
Loch Leven trout			25,860	25,860
Lake trout	35,332,000	33,395,155	3,699,158	72,426,313
Brook trout	935,600	5,972,495	7,868,932	14,777,027
Sunapee Lake trout		8,000		8,000
Grayling	125,000	1,078,000		1,203,000
Smelt		28,000,000		28,000,000
Pike and pickerel			103,643	103,643
Freshwater drum			29,804	29,804
Crappies			1,565,072	1,565,072
Largemouth black bass		320,050	961,912	1,281,962
Smallmouth black bass		237,600	149,837	387,437
Rock bass			91,742	91,742
Warmouth bass			2,400	2,400
Sunfish			2,670,513	2,670,513
Pike perch	212,900,000	174,097,500	15,874	387,013,374
Yellow perch		175,421,000	163,839	175,584,839
White perch		32,625,000		32,625,000
White bass			15,298	15,298
Striped bass		16,137,000		16,137,000
Mackerel		2,341,000		2,341,000
Butterfish		920,000		920,000
Cod	1,000,000	236,786,000	2,648	237,788,648
Pollock		1,474,096,000		1,474,096,000
Haddock		6,720,000		6,720,000
Flounder		1,814,696,000		1,814,696,000
Miscellaneous fishes			16,708	16,708
Lobster		110,260,000	5,400	110,265,400
Total	318,939,100	4,757,908,782	82,115,411	5,158,963,293

The foregoing output may be conveniently classified on the following geographic basis, which agrees quite closely with the general character of the operations of the hatcheries:

Marine species of the Atlantic coast	3,646,827,048
Migratory species of the Atlantic coast	333,322,576
Fishes of the Great Lakes	926,201,687
Migratory fishes of the Pacific coast	206,173,456
Fishes of the interior waters	46,438,526
Total	5,158,963,293

It is possible to record a further reduction in the unit cost of fish-cultural operations. Taking into consideration all expenditures chargeable to fish culture and fish distribution, together with the salaries of all employees in the fish-cultural service, the cost of fish produced and planted in 1917 was $114.46 per million, as against $117.86 in 1916, $131.65 in 1915, $146.36 in 1910, and $239 in 1905. This record is noteworthy in view of the increased cost of all supplies, materials, and temporary labor, and indicates increased efficiency and economy.

HATCHERIES OPERATED.

During the year the Bureau operated 55 regularly established hatcheries, 19 subhatcheries, and 74 egg-collecting stations. The stations in alphabetical order, with the subsidiary stations thereunder, the period of operations, and the species handled, are shown in the following table:

Fish-Cultural Stations Operated During the Fiscal Year 1917.

Designation.	Period of operation.	Species handled.
Afognak, Alaska	Entire year	Blueback and humpback salmons.
Seal Harbor, Alaska	June–October	Blueback salmon.
Uganak, Alaska	do	Do.
Baird, Cal	Entire year	Brook and rainbow trouts, chinook salmon.
Battle Creek, Cal	December–April	Chinook salmon.
Hornbrook, Cal	January–May	Chinook and silver salmons, rainbow trout.
Mill Creek, Cal	December–April	Chinook salmon.
Baker Lake, Wash	Entire year	Blueback, chinook, silver, and steelhead salmons.
Birdsview, Wash	do	Blueback, chum, humpback, silver, and steelhead salmon.
Brinnon, Wash	do	Chum and silver salmons, steelhead salmon.
Barrington, Wash	April–June	Chum and silver salmons.
Duckabush, Wash	October–June	Chinook, chum, humpback, silver, and steelhead salmons.
Illabott Creek, Wash	do	Chinook and chum salmons.
Quilcene, Wash	Entire year	Chum, humpback, silver and steelhead salmons.
Quinault, Wash	do	Blueback, chinook, and silver salmons.
Sultan, Wash	do	Silver and steelhead salmons.
Boothbay Harbor, Me	do	Flounder, pollock, lobster.
Portland, Me	July–October, May–June	Lobster.
Bozeman, Mont	Entire year	Blackspotted, brook, rainbow, and lake trouts, steelhead salmon, grayling.
Odell Creek, Mont	March–May	Grayling.
Meadow Creek, Mont	do	Grayling and rainbow trout.
Yellowstone, Wyo	July and June	Blackspotted trout.
Clear Creek, Wyo	do	Do.
Columbine Creek, Wyo	do	Do.
Cub Creek, Wyo	do	Do.
Lake Camp, Wyo	do	Do.
Pelican Creek, Wyo	do	Do.
Bryans Point, Md	March–May	Shad and yellow perch.
Cape Vincent, N. Y	Entire year	Brook, lake, and rainbow trouts, lake herring, landlocked salmon, pike, and yellow perches, whitefish.
Chaumont, N. Y	November and December	Whitefish.
Galloo Island, N. Y	October–November	Lake trout.
Grassy Bay, N. Y	May	Yellow perch.
Henderson Harbor, N. Y	November–December	Lake herring.
Ogdensburg, N. Y	April–May	Pike perch.
Pigeon Island, N. Y	October–November	Lake trout.
Old Forge, N. Y	November	Whitefish.
Sodus Point, N. Y	November–December	Lake herring.
Stony Island, N. Y	November	Lake trout.
Three Mile Bay, N. Y	November–December	Lake herring and whitefish.
Upper Saranac, N. Y	November	Whitefish.
Central Station, Washington, D.C.	Entire year	Shad, pike, and yellow perches.
Clackamas, Oreg	do	Brook and rainbow trouts, steelhead, chinook, and silver salmons.
Applegate, Oreg	April–June	Chinook, silver, and steelhead salmons.
Big White Salmon, Wash	December–March	Chinook salmon.
Snake River, Oreg	October	Do.
Little White Salmon, Wash	July–May	Chinook and chum salmons.
Rogue River, Oreg	Entire year	Blackspotted trout, chinook, steelhead, and silver salmons.
Upper Clackamas, Oreg	do	Chinook, steelhead, and silver salmons.
Willamette River, Oreg	July and June	Shad.
Cold Springs, Ga	Entire year	Bass, catfish, sunfish.
Milltown, Ga	May	Bass.
Craig Brook, Me	Entire year	Atlantic, humpback, and landlocked salmons, brook trout.
Duluth, Minn	do	Brook and lake trouts, pike perch, whitefish, steelhead salmon.
Grand Marais, Minn	October–December	Lake trout, whitefish.
Susie Island, Minn	November	Lake trout.

FISH-CULTURAL STATIONS OPERATED DURING THE FISCAL YEAR 1917—Continued.

Designation.	Period of operation.	Species handled.
Edenton, N. C	Entire year	Black bass, shad, sunfish, white perch.
Weldon, N. C	April–May	Striped bass.
Erwin, Tenn	Entire year	Brook and rainbow trout, black bass, carp, sunfish, rock bass.
Fairport, Iowa	do	Black bass, buffalofish, carp, catfish, crappie, drum, pickerel, pike, perch.
Black River, Ark	October–December	Black bass, buffalofish, carp, catfish, crappie, pike perch, sunfish, suckers.
Cumberland River, Ky	November–December	Black bass, crappie, sunfish.
Lake Cooper, Ill	August–December	Black bass, buffalofish, carp, catfish, crappie, pickerel, sunfish, pike and yellow perches.
Lake Pepin, Minn	September–November	Black bass, buffalofish, carp, catfish, crappie, pickerel, pike perch, sunfish, yellow perch.
Gloucester, Mass	Entire year	Butterfish, cod, flounder, haddock, lobster, mackerel, pollock.
Green Lake, Me	do	Brook trout, steelhead, landlocked, and humpback salmons, smelt.
Grand Lake Stream, Me	September–June	Landlocked salmon.
Homer, Minn	Entire year	Black bass, buffalofish, catfish, carp, crappie, drum, pike, rock bass, sunfish, yellow and pike perches, brook and rainbow trouts.
La Crosse, Wis	do	Black bass, buffalofish, carp, catfish, brook trout, crappie, drum, pike, pike perch, rock bass, sunfish, yellow perch.
Leadville, Colo	do	Blackspotted, brook, rainbow, and lake trouts, grayling.
Antero Lake, Colo	April–May	Rainbow trout.
Crystal Lake, Colo	November	Brook trout.
Englebrecht Lake, Colo	October–November	Do.
Hoselkuss Lake, Colo	do	Do.
Musgrove Lake, Colo	do	Do.
Northfield Lake, Colo	do	Do.
Smith Ponds, Colo	do	Do.
Turquoise Lake, Colo	do	Do.
Uneva Lake, Colo	do	Do.
Woodland Park Lake, Colo	do	Do.
Seven Lakes, Colo	June	Blackspotted trout.
Louisville, Ky	Entire year	Black bass, crappie, pike perch, rock bass, sunfish, chinook salmon, rainbow trout.
Mammoth Spring, Ark	do	Black bass, catfish, rock bass, sunfish.
Friar Point, Miss	July–December	Black bass, buffalofish, carp, catfish crappie, rock bass, sunfish.
Manchester, Iowa	Entire year	Brook and rainbow trouts, rock bass, smallmouth bass.
Bellevue, Iowa	August–December	Black bass, buffalofish, carp, catfish, crappie, drum, pike, sunfish, warmouth bass, white bass, yellow perch.
North McGregor, Iowa	do	Black bass, buffalofish, carp, catfish, crappie, pike, rock bass, sunfish, yellow perch.
Galena, Ill	November	Black bass, buffalofish, carp, drum, pike, river herring, sunfish, warmouth bass, yellow perch.
Nashua, N. H	Entire year	Brook, lake, and rainbow trouts, smallmouth bass.
Neosho, Mo	do	Black bass, crappie, rainbow trout, rock bass, sunfish, yellow perch.
Northville, Mich	do	Brook, lake, and rainbow trouts, smallmouth bass.
Alpena, Mich	April–May	Lake trout, whitefish.
Bay City, Mich	April	Pike perch.
Bay Port, Mich	November	Whitefish.
Brevort, Mich	do	Do.
Belle Isle, Mich	October–November	Do.
Charity Island, Mich	do	Do.
Charlevoix, Mich	April–May, November	Lake trout, whitefish.
Cheboygan, Mich	October–November	Lake trout.
Detour, Mich	do	Do.
Detroit, Mich	April–May, December	Pike perch, whitefish.
Fairport, Mich	October–November	Lake trout.
Frankfort, Mich	do	Do.
Grand Haven, Mich	do	Do.
Isle Royale, Mich	do	Lake trout, whitefish.
Keystone, Mich	do	Lake trout.
Leland, Mich	do	Lake trout, whitefish.
Manistique, Mich	do	Lake trout.
Marquette, Mich	do	Do.
Monroe, Mich	April–May	Pike perch.

FISH-CULTURAL STATIONS OPERATED DURING THE FISCAL YEAR 1917—Continued.

Designation.	Period of operation.	Species handled.
Northville, Mich.—Continued.		
Munising, Mich	October-November	Lake trout.
Munoscong, Mich	April	Pike perch.
Naubinway, Mich	October-November	Whitefish.
Northport, Mich	do	Lake trout, whitefish.
Ontonagon, Mich	do	Lake trout.
St. Ignace, Mich	do	Lake trout, whitefish.
St. James, Mich	do	Lake trout.
St. Joseph, Mich	do	Do.
South Manitou, Mich	December	Whitefish.
Port Lookout, Mich	do	Do.
Orangeburg, S. C	Entire year	Black bass, sunfish.
Branchville, S. C	March-April	Shad.
Jacksonboro, S. C	do	Do.
Put in Bay, Ohio	Entire year	Lake trout, whitefish, pike, perch.
Middle Bass, Ohio	April, November-December.	Pike perch, whitefish.
North Bass, Ohio	do	Do.
Port Clinton, Ohio	do	Do.
Toledo, Ohio	do	Do.
Quincy, Ill	Entire year	Black bass, buffalofish, catfish, crappie, pike perch, rock bass, sunfish, yellow bass, yellow perch.
St. Johnsbury, Vt	do	Brook, lake, rainbow, and sunapee trouts, landlocked and steelhead salmons, yellow perch.
Darling Pond, Vt	July-December	Brook trout.
Holden, Vt	Entire year	Brook, lake, and rainbow trouts, steelhead and landlocked salmons.
Lake Mitchell, Vt	September-December	Brook trout.
Swanton, Vt	April-May	Pike and yellow perches.
Berkshire, Mass	Entire year	Brook trout.
San Marcos, Tex	do	Black bass, crappie, rock bass, sunfish.
Saratoga, Wyo	do	Blackspotted, brook, and rainbow trouts, steelhead salmon.
Spearfish, S. Dak	do	Brook, blackspotted, lake, rainbow, and Loch Leven trouts.
Tupelo, Miss	do	Black bass, catfish, crappie, sunfish.
White Sulphur Springs, W. Va	do	Brook and rainbow trouts, black bass, sunfish.
Woods Hole, Mass	do	Cod, flounder, mackerel.
Menemsha, Mass	January-April	Flounder.
Waquoit, Mass	do	Do.
Wickford, R. I	do	Do.
Wytheville, Va	Entire year	Black bass, brook and rainbow trouts, rock bass, sunfish.
Yes Bay, Alaska	do	Blueback salmon.
Smeaton Bay, Alaska	August-September	Do.

Early in the fiscal year an additional hatchery was added to the number already in operation, through the acceptance of a donation by Mrs. Mary A. Scully of a trout-hatching plant which had been constructed and successfully operated as a private venture for some years by her husband, the late John S. Scully, of Massachusetts. This property consists of about 135 acres of land in the heart of the Berkshire Hills, some 7 miles from Great Barrington, Mass., with the ponds and buildings required for a complete trout hatchery. A joint resolution of Congress, authorizing the Secretary of Commerce to accept the gift on behalf of the Government was signed by the President on July 28, 1916, and shortly thereafter the Bureau instituted active trout operations with the stock of fish included as a part of the donation.

DISTRIBUTION OF THE HATCHERY OUTPUT.

The output of the hatcheries, planted under favorable conditions and in well-considered places, reached every State and Alaska. The commercial fishes were distributed for the most part in local waters,

on the initiative of the Bureau and under the immediate direction of the various station superintendents. The fishes adapted for the minor interior waters were largely planted on applications from States, clubs, associations, and individuals bearing the indorsement of Senators or Representatives.

In the course of the year the fish-distributing cars traveled a total of 138,717 miles, the paid transportation amounting to 122,778 miles. Although the output of fish was larger than ever before, a material reduction in distribution expenses by messengers was effected, through the systematic planning of the work with the view of supplying all species without covering the same territory twice. By this means the messenger travel of 645,721 miles in 1916 was reduced to 554,597 miles in 1917. The average cost per mile for movement of the Bureau's cars, based on data compiled for the fiscal year 1916, was $0.144, including fares of the car crews.

A new fish transportation car, for which Congress had provided an appropriation of $20,000, was completed and put in commission shortly after July 1, 1916. This car is of steel construction throughout except for the doors and windows, and is equipped for carrying 140 cans of fish. Its use has greatly facilitated the distribution work, as it carries a load almost 50 per cent larger than the old cars.

Small shipments of eggs have been made to foreign countries, in response to official requests. Thus, there were forwarded to Canada 96,000 rainbow-trout eggs and to Japan 100,000 brook-trout eggs and 101,000 rainbow-trout eggs. To the Canal Zone there were sent 2,750 fingerling, black bass, catfish, rock bass, and sunfish, at the request of the canal administration.

A detailed statement of the distribution and planting of fish is published separately as a part of this report, and is available for gratuitous distribution. This statement shows by States and localities the number and age of fish of each species distributed during the year.

PROPAGATION OF THE PACIFIC SALMONS.

The run of both red and humpback salmons in the vicinity of the Afognak station was the largest that has occurred in that region since the year of the eruption of Mount Katmai in 1912. In connection with the run of the former species, it is noteworthy that Litnik Lake was the only point in the ash belt where any number of redfish were noticeable, and nearly all the other lakes which they frequented before the eruption were barren. Whether this run, consisting of individuals of an inferior size, was affected by remote influences or was in part or altogether the result of the hatchery plantings is conjectural.

Collections of red-salmon eggs extending from July 26 to October 18 amounted to 22,424,000, of which 4,678,000 were taken at Seal Bay and 692,000 at Uganak Bay. To these acquisitions was added a gift of 1,016,000 eyed eggs from the Karluk hatchery of the Alaska Packers Association. Some of the later eggs were more than seven months in process of hatching, due to the fact that the water temperature remained around 33° F. until after the middle of April, following a very severe winter. Fry began taking food late in April, and 8,871,000 were on hand at the end of the fiscal year after 10,296,000 had been liberated. Freshened salt salmon, a by-product of spawning operations, was fed with satisfactory results. Its prepa-

ration consisted in soaking in running water for 24 hours, removing skin and bones, and grinding. It was next placed in boiling water, which caused the flesh to granulate, and was then reground. When granulated by the boiling-water treatment a greater proportion is eaten, whereas when the raw flesh is reduced to a fine state by the second grinding a large part, in the form of a milky fluid, is lost when put into the water. The fry are fed from six to eight weeks, and released only when it becomes necessary to provide feeding space for more recent hatchings.

At Litnik Lake 25,310,000 humpback-salmon eggs were collected between August 11 and September 11. At Seal Bay 3,010,000 of this species were obtained and more were in sight, but collecting had to be discontinued in order to reserve space for redfish eggs. At Uganak Bay when 10,730,000 had been taken all space was filled and collections were necessarily suspended. Late in October all these eggs were transferred from the field stations to Afognak hatchery and the auxiliaries were closed. In the course of the season, a transfer of 16,000,000 humpback-salmon eggs was made to Seattle, Wash., half of them being destined to Puget Sound stations and half to stations in Maine. The 19,343,000 humpback fry produced at Afognak were held as long as possible, but owing to lack of room it was necessary to plant them prior to sac absorption. Most of them were released in the river below the lake and were widely scattered so that they might settle in crevices between the rocks covering the river bed.

Although the run of red salmon in the vicinity of Yes Bay station was commercially far below that of the preceding year, a good collection of eggs was made. Although the number secured was not as large as in the previous year, when 72,000,000 were taken, the figures of the average year were surpassed by several millions.

While facilities for rearing were limited, more than 800,000 fingerlings were produced and liberated in the course of the season and 785,500 were being held at the end of the fiscal year. From 58,000,000 eggs collected, mainly in September, 49,600,000 fry were liberated, and 2,000,000 eyed eggs were supplied to the Oregon State hatchery at Bonneville. The salt-solution process was employed for the removal of dead eggs.

The combined output of fingerling salmon from the Washington stations was above 37,000,000, while upward of 3,000,000 additional, in process of rearing, were carried over into the new fiscal year. Steelhead fingerlings released numbered nearly 4,000,000. Egg collections at these stations were generally successful, though diminished because of the off year for humpback salmon. A feature at Birdsview station was the taking of 38,000 humpback-salmon eggs. This species has heretofore visited these waters only every second year, and this appearance in Grandy Creek can not be regarded otherwise than the result of the Bureau's effort to establish an annual run by the transfer of eggs from Alaska. Conditions were most unfavorable during the humpback run, Grandy Creek being at a low stage, and the water spread out over the wide gravelly bar at the creek's mouth, making it difficult for fish to enter. No eggs were taken at any other Washington station, although fishermen, noting their off-year appearance, made reports from various places which indicated the taking of quite a number. Alaska humpback fry, the product of 4,000,000 eggs, were again introduced in this stream. The same conditions that hampered

the entrance of humpbacks into the creek prevailed during the sockeye run, otherwise larger results would undoubtedly have been recorded. In the spring, several sockeye salmon, from 6 to 10 inches in length, were taken in the creek. Another shipment of 225,000 eggs was sent from Quinault station in order to continue the plantings in Puget Sound.

Low water curtailed the chinook-egg collections in the Puget Sound region, but hatching results were good, the fry taking food more readily and developing more rapidly than any other species. The steelhead run was late, but nearly as many eggs were collected as last year, and over a million were transferred to Maine and other points eastward. The take of silver-salmon eggs was 2,000,000 in excess of last year.

At Baker Lake the sockeye-egg collections numbered 5,445,000, surpassing the previous year by 2,000,000. An unusual occurrence was the fact that about 22 per cent of the eggs could not be fertilized, though the fry resulting from the fertile ones were normal. The silver-salmon eggs were infertile to a somewhat greater extent. A battery of troughs was set up outside the hatchery for the rearing of fry. All fish were fed to some extent prior to releasing them. All chum and silver salmon fry at Darrington station were reared to the feeding stage. There was an increase in the aggregate egg collections of chinook, chum, silver and steelhead salmons at Illabot Creek station, but at Day Creek a falling off occurred. All eggs at the latter point were transferred to Birdsview for hatching. At Sultan station a washout reduced the egg collections. All fry at this point were fed prior to release. A slough pond, 150 by 4 feet in area and 1½ feet deep, was constructed, and used with excellent results for holding and feeding young fish.

At Duckabush station there was an unusually small run of chum salmon, and as trouble was experienced from log jams, at least half the run of chum and all the silver salmons escaped capture. At Brinnon station, though conditions were like those at Duckabush, increased collections of silver and chinook salmons eggs were made, despite the fact that unlawful purse-seine fishing was conducted below, for which some of the fishermen were convicted by State authorities. Most of the steelhead run at this station escaped when the rack was washed out in May or when log jams prevented fishing. The work at the Duckabush and Quilcene stations was greatly facilitated by the purchase of two motor trucks during the latter part of the fiscal year.

An interesting item in connection with the work at this field was the result attained from feeding in the so-called slough pond, an arm of the Walcotts Slough, which was screened to exclude enemy fish. All the salmon fry hatched at Brinnon, and the younger specimens of fish forwarded from Duckabush and Quilcene, were placed in this pond and fed regularly. They made a rapid growth and the losses were slight. They were allowed to pass out at will, the meshes of the screen being large enough to permit their escape. The chum salmon left the slough at the end of four or five weeks, although they had in almost every case been fed for about the same length of time in troughs or cement ponds before their transfer to the slough. The chinook and silver salmons remained for a longer period and left the slough in a body.

At Quilcene station the collections of all species except humpback were larger than last year, a noticeable increase being in steelheads, which numbered 420,000 as against 45,000 in the previous year. Good success was attained in hatching, the fry losses were normal, and all young were fed and planted as advanced fry or fingerlings. Two million humpback eggs from Afognak station, Alaska, hatched well, and the young were reared to fingerling size before liberation.

A power machine for grinding fish food was installed at Birdsview and a motor truck was acquired, and both appliances effected important economies in time and labor. The shore of Grandy Creek was protected by a plank wall for arresting erosion and to prevent the flooding of the station grounds. At Illabot and Day Creeks the battery shelters were inclosed with rough-board siding for the exclusion of snow and wind, and at the former a heating coil was installed, its hot-water discharge entering the hatchery supply flume, with the object of preventing freezing and water stoppage. At Sultan the open end of the hatchery was boarded in, 11 new troughs and fittings were added, and an earth rearing-pond was constructed.

The Quinault, Wash., substation is located on one of the most important blueback-salmon streams in the United States at the present time, but it is unquestionably being heavily overfished. While the close season is always complied with, it consists of only one day each week, and as fishing operations are conducted for a distance of several miles up the river, it is believed the fish entering the streams at the beginning of a closed period do not pass beyond the last traps before fishing is again resumed. The run of four years ago was extremely small and was in part responsible for the diminished numbers entering the past season. While there is no way of definitely determining the number of fish reaching Quinault Lake in the course of a season, a very close estimate may be arrived at by basing it on the number taken by the Indians at the mouth of the river. This during the past year indicated one of the poorest seasons on record in the region. The run to the upper waters was 10 days late owing to low water. Many fish that collected in deep holes, apparently waiting for a rise, were taken by seining, and most of them being ripe, they were stripped where caught. The spawning season began November 10, and the total egg collections amounted to 13,395,000. Hatching was delayed a month by cold weather and snow in the mountains. A part of the young had to be released in the sac stage owing to lack of trough room. About 50,000 were held per trough until the sac was absorbed, when they were liberated down to 6,000 and these held for fingerling production. Dead eggs were removed by salt solution, and with such effectiveness that the care of the eggs required the time of only two men.

About 45,000 blueback fingerlings brought over from last year were the product of eggs from Alaska. Of these 42,502, by actual count, were marked by the removal of the adipose and left ventral fins, and liberated in August and September. The losses from marking were slight.

Blueback-salmon fingerlings were observed in Quinault Lake in much larger numbers than in the previous two years, many thousand being seen feeding in schools near the surface in May and June. Incidental to blueback fishing, there were collected 235,000 chinook

eggs which produced 160,000 fry. The run of silver salmon was the largest since the establishment of the station and contained many large males, some of them weighing 25 pounds. The egg collections of this species numbered 2,166,000, from which 1,910,000 fry were hatched and distributed. Three earth ponds, each 40 by 16 feet, were built during the year and successfully used in rearing operations. An addition of 25 feet was built to the east end of the hatchery, making it 40 by 127 feet, with capacity for 100 hatching troughs.

In the Oregon field, the egg collections of all species for the year numbered 39,941,100, and the output amounted to 35,099,392 fish and eggs. The earlier salmon-egg collections in the Columbia Basin were above the average, but there was soon a diminution, because of the redoubled efforts of commercial fishermen, who were spurred on by the higher prices paid for salmon. The operations of these men are jeopardizing the industry.

Through a technicality discovered in the law, Clackamas River was thrown open to commercial fishing after having been closed about eight years. This stream has heretofore been gaining each year, notwithstanding the strenuous fishing near its mouth and on the Willamette River. Unless there is relief within a reasonable time, it is feared that salmon fishing on the Clackamas will soon be a thing of the past.

From Clackamas station a large distribution of trout was made throughout Washington and Oregon. An autotruck, transferred from Baird station, greatly facilitated and cheapened the distribution. Shad operations were undertaken during the early summer months as usual at Willamette Falls, and two new collecting fields were opened up—one at St. Helens, on the main channel of the Willamette River, and one at Astoria, on Youngs River. Flood waters from melting snows and warm backwaters materially hampered the work, and up to the close of the fiscal year only 1,861,000 shad eggs had been secured at the three points.

At the upper Clackamas station low water prevented satisfactory runs of chinook and silver salmons. Two earth ponds were built at this point for the alternate holding of adult fishes while ripening and fry undergoing rearing. An abundant supply of water followed the introduction of a new 6-inch line.

Collections of chinook eggs for Little White Salmon station were satisfactory only at first or while the Columbia River was yet closed to commercial fishermen. Then fishing became a handicap, reducing collections to about half the amount of the preceding year, or to 17,914,000 eggs. During the long period that the Columbia River was at flood stage, the fish remained at the mouth of the river where they were captured by trolling operations of commercial fishermen. The intensity of these operations is evidenced by the fact that one concern in Astoria paid the commercial fishermen $52,000 for the salmon taken by that method. From stripped salmon a sufficient number of carcasses were preserved to meet the food requirements of young fish. Some of the flesh was smoked, but most of it was salted. In former years these fish have been discarded. During July and August 50,000 chinook fingerlings were marked by the removal of the posterior half of the dorsal fin and the left ventral fin. The fish averaged about 2½ inches in length, and were not in the best

of condition. They were hatched from "fall" eggs. At this station 20 ponds of the series planned were completed in time to be utilized in the rearing of chinook fry. They are patterned after the modern series at Quilcene station, and can be emptied, thoroughly cleansed, and otherwise handled at minimum expense. The most detrimental effect of the intensive fishing for chinook salmon on the lower Columbia River was experienced at the Big White Salmon station, very few fish appearing after the first two days of the run.

At the Rogue River station, where 5,626,000 eggs of this species were collected, only 1,683,000 were obtained the year before. The run of fish was the largest ever known on that river, but only a few escaped the fishermen and ascended to waters in the vicinity of the station. These were spring run, and as no trace of a fall run reached the hatchery, it is probable that the greater part of the run was canned. The pack of two canneries at the mouth of the river exceeded anything in the past, the passage for the fish being practically obstructed by the gill nets, which were installed in every favorable eddy. The Ament dam across Rogue River again proved a serious obstruction to the ascent of salmon to the hatchery, the fishway on the north side not being in working order, while the ladder on the opposite side has never been satisfactory. Steps are being taken by the State board of fish commissioners and local sportsmen to remedy these defects. While the steelhead-egg collections were large, they were not proportionate to the number of fish in the lower river.

The first runs of fall chinook and silver salmons in Applegate Creek were nearly total failures so far as propagation was concerned. Practically all the chinook salmon were taken by commercial fishermen, and the silver salmon did not make their appearance in this field in the usual numbers. Whether this was due to the extremely low temperatures or was caused by oceanic conditions is unknown. Collections of steelhead eggs exceeded former records, nearly 6,750,000 being taken; and to relieve the congested conditions in the hatchery more than 2,000,000 were transferred to State hatcheries and to points in the East. Adult fishes, captured by means of jumping box and trap, were held in the station ponds for ripening, but the excessively cold weather retarded their development and they accumulated to such an extent that 5,000 were on hand at one time. This long retention caused a considerable percentage of the eggs to become "glassy" or "dry" and incapable of fertilization.

At several of the Bureau's Oregon stations where steelhead rearing operations were conducted, the State authorities cooperated in the work to the extent of providing funds for the feeding of the steelheads to the fingerling stage. This work was also actively supported by various anglers associations in the State.

The output of the Baird (Cal.) station and its auxiliary stations for the year numbered 22,748,250 eggs, fry, and fingerling fish, over 14,000,000 being of the latter classification. There was no run of salmon in the McCloud River at Baird. The eggs hatched at this point were transferred from the auxiliaries, chiefly from Battle and Mill Creeks, which furnished nearly 10,000,000 chinook eggs for development at Baird and the California hatchery at Sisson. Fry produced at Baird station numbered nearly 4,000,000, including 67,000 brook and rainbow trouts.

The chinook-egg collections at Battle Creek were only fair, amounting to 14,293,000. Owing to the high temperature of the hatchery water supply, the fry in course of rearing had to be liberated as early as April 11. In May chinook-salmon fingerlings to the number of 13,850 were marked at the Battle Creek hatchery by the removal of the adipose and right ventral fins; the fish were about 2 inches long, and although they were the product of the last eggs taken in the fall, they were apparently in good condition when liberated. Temporary earth ponds were utilized to relieve the hatchery of fry, the young being allowed to leave them at will.

Between October 24 and December 8, 7,026,000 chinook-salmon eggs were collected at the Mill Creek station, and several tons of stripped salmon were smoked and salted as a fish food. The young refused this food when from 6 to 8 weeks old, and as the water supply was dangerously warm, the fish were liberated and the station was closed by April 15.

The silver-salmon run at the Hornbrook hatchery was almost a complete failure and but few eggs of that species were collected. There was also a reduced run of chinooks as compared with last year. Of the 2,940,900 eggs secured, 1,000,000 were transferred to the State hatchery at Sisson, owing to partial failure of the water supply.

At the various stations on the Pacific coast and in Alaska, where the salmon fry and fingerlings were fed from five to nine times daily, a mixed diet was used. The ingredients consisted of salted salmon, smoked salmon, soluble blood meal, middlings, spleen, and liver, the principal ingredient being salted salmon. Owing to its high cost, liver was used very sparingly and only during the early stages of growth. Spleen was added for variety. Difficulty was experienced with the smoked salmon, as generally the fry refused it, and in every case where it was fed the losses were largely increased. From the results secured it is assumed that this material is not suitable for young salmon.

PROPAGATION OF COMMERCIAL FISHES OF THE GREAT LAKES.

The efforts put forth in the propagation of the commercial fishes of the Great Lakes were quite successful. The largest collection of lake-trout eggs in the history of the Bureau was made, while the take of whitefish and lake-herring eggs slightly exceeded the collections of last year, notwithstanding that storms interfered with the operations to a considerable extent in some of the more important fields. The only species propagated in this region which shows a material reduction in output is the pike perch, and this was caused by the abnormally late spring, the spawning grounds being heavily coated with ice at the time when the run of fish thereto usually occurs.

Late in September field stations of the Duluth hatchery for the collection of lake-trout eggs were opened up in the vicinity of the important fisheries in Lake Superior, and during October and November 25,385,000 eggs of good quality were secured and transferred to the Duluth hatchery. This being in excess of the number that could be conveniently handled and at the same time allow hatching space for other species of eggs to be accommodated later on, it was

decided to turn over 3,000,000 green eggs to the Wisconsin Conservation Commission. With the appearance of the eye-spots in February, further shipments, aggregating 1,350,000, were consigned to applicants, and from the remainder 14,955,000 young fish were hatched and distributed, most of them in Lake Superior.

Incidental to the lake-trout collections, 1,785,000 whitefish eggs were taken at the fishery near Grand Marais, Minn., and these, together with a stock of 25,000,000 green eggs of this species forwarded to Duluth from the Put in Bay field, produced 7,130,000 fry, most of which were planted in Lake Superior.

Active operations were inaugurated in Michigan waters on October 18 with the taking of the first lot of lake-trout eggs in the vicinity of Detour, Mich., and from that time until the end of November daily collections of this species were made at 1 or more of the 13 collecting stations operated from Northville. The favorable weather prevailing during the spawning period permitted almost daily attendance at the nets, and as there was a good run of fish the outcome of the operations was the largest collection of lake-trout eggs in the history of the Bureau's work. Out of a total of 86,379,200 secured, 58,889,000 were taken in the vicinity of Charlevoix, St. James, and Manistique, the yield in the remaining fields ranging from less than 200,000 at some points to several millions at others. Of this stock 32,000,000 in round numbers were laid down for hatching in the Charlevoix, Alpena, and Sault Ste. Marie substations. About 18,000,000 were furnished green to Federal and State hatcheries outside of Michigan, and all of the eyed eggs produced at Northville from the remainder, amounting to 22,507,000, were also shipped on assignment to other hatcheries. The eggs in the Sault Ste. Marie hatchery were turned over later to the Michigan Fish Commission, while from the stock incubated at the other substations named 14,662,000 were hatched and distributed on contiguous spawning grounds.

Whitefish spawning operations in the Michigan territory opened October 24, in the Detroit River, and the last eggs of the season were obtained on December 26 at Northport, Mich. From these and nine additional collecting points, located in Saginaw Bay, upper Lake Michigan, and Grand Traverse Bay, eggs to the number of 95,520,000 were obtained. Weather conditions throughout the season were reported as normal, but the catch of the commercial fishermen at all points was light, averaging not more than 50 per cent of the take in previous years. The resulting shortage in the stock of the Detroit hatchery was made up by the transfer thereto of 48,680,000 eggs taken in Lake Erie under the direction of the Put in Bay, Ohio, superintendent. The entire number yielded 100,000,000 eyed eggs, 60,000,000 of which were transferred to the Alpena and Charlevoix hatcheries with the view of distributing the resulting fry on near-by spawning grounds. The remaining 40,000,000 were hatched without loss at Detroit, and the product was liberated in the Detroit River and on other spawning beds in the lower lakes where operations had been conducted.

The gathering of pike-perch eggs for stocking the Detroit hatchery was begun April 11 in Saginaw Bay, off Bay City, Mich., and on May 5 in Munoskong Bay, an arm of St. Marys River. From these two fields 162,150,000 eggs were secured. This number was reduced by

losses to 50,250,000 eggs after the eye spots had been developed in the Detroit hatchery. In accordance with the terms of the lease granting the Bureau the use of this hatchery, 40,500,000 eyed eggs were turned over to the Michigan Fish Commission. Part of the fry hatched from the balance were planted in inland waters of Michigan and the remainder were deposited in Lake Huron, Saginaw Bay, and Detroit River.

Prior to the opening of the fishing season in Lake Erie the force of the Put in Bay station was engaged in repairs and improvements to grounds and buildings and in getting the equipment in shape for field operations. Preparations were made for conducting whitefish propagation on the largest scale commensurate with the funds available; and, in order to save every possible egg, men were detailed to the various fisheries in advance of the spawning season, in November, to see that the fishermen were supplied with all necessary utensils for taking and fertilizing eggs, and to give the uninitiated instructions as to the proper method of procedure. A force was assigned in due season to the important fisheries at the west end of the Lake near Monroe Piers to install crates for the holding of unripe fish pending the development of their eggs. However, a severe storm prevailed during November 15 and 16, just when the fish had commenced to congregate in numbers on the reefs and in the shoal waters around the shore, causing the water to recede to several feet below normal and starting such a strong current in the Lake that nearly all the commercial nets were wrecked. The fish were driven into deeper waters, where they remained so long that most of the fishermen removed their nets from the Lake, fearing to trust them out so late in the season because of the destructive effects of ice. Through the hearty cooperation of the fishermen, 2,218 partly ripe fish were obtained and penned after the storm had subsided, and the egg returns from this relatively small brood stock were satisfactory, thus redeeming the operations from complete failure which at the height of the spawning season seemed inevitable.

In other portions of Lake Erie the collections averaged up to the records of past years and in some instances exceeded them. Of the eight fields occupied, the largest measure of success was obtained at Port Clinton, Toledo, and Isle St. George, which yielded 115,760,000, 69,680,000, and 66,440,000 eggs, respectively. The collections from all portions of the Lake amounted to 357,240,000 eggs, and had the nets been in good condition after the storm it is believed the take would have broken all records, as the fish must have returned to the spawning grounds in great numbers, judging from the quantities taken in nets that were afterwards found to be badly damaged. Assignments of green eggs to State hatcheries and stations of the Bureau, aggregating 121,700,000, were forwarded direct from the fishing fields. The remainder were hatched, producing 208,500,000 fine, healthy fry for return to the spawning grounds.

As the Ohio Fish Commission was able to satisfactorily care for all eggs of the cisco, or lake herring, available in Lake Erie, no attempt was made by the Bureau's men to obtain eggs of that species, this being in accordance with an agreement previously entered into with the State authorities.

Notwithstanding the exceedingly cold and prolonged winter experienced in this region, a few warm days near the end of March sufficed

to remove all traces of the unusually heavy coating of ice on the pike-perch spawning grounds, and the fishermen were able to install their nets earlier than for several years past. Rough weather prevailed during the first few days of April, however, making it impossible to fish until the 7th, when a lot of eggs came in from the Port Clinton field. From that time on daily collections were received until the close of the spawning season on May 6. The weather conditions during this period were generally favorable, and the results of the work were satisfactory, 611,250,000 eggs being secured, or about 20,000,000 in excess of any season's collections on this lake since the spring of 1911. Green eggs to the number of 166,200,000 were shipped on application, leaving 445,000,000 to be laid down in the Put in Bay hatchery. After the development of the eye spots 52,000,000 additional eggs were utilized in filling assignments and from the remaining stock 115,500,000 vigorous fry were hatched, nearly all of which were returned to Lake Erie.

Fish-cultural work at Cape Vincent opened October 18 with the receipt of small lots of lake-trout eggs from Galloo and Stony Islands, in New York waters, and from the commercial fisheries near Pigeon Island, Ontario. The collections were interfered with by prevailing high winds, and, as a consequence, only 762,000 eggs were secured from the entire Lake Ontario field. To make up for the shortage in lake-trout eggs for this hatchery, 9,400,000 green and 1,750,000 eyed eggs were forwarded from Michigan. From this stock 6,315,000 fry were hatched which, with the exception of 179,000 furnished to New York applicants for stocking interior waters, were all liberated in suitable parts of Lake Ontario.

During the fall of 1916 arrangements were made by the superintendent of Cape Vincent station to cooperate in whitefish propagation with the New York Conservation Commission at Old Fort and Upper Saranac, N. Y., and to collect independently from commercial fisheries in the vicinity of the station, at Three Mile Bay and Chaumont Bay, N. Y.; also on the Canadian side of Lake Ontario around South Bay. This latter field, which had never before been canvassed by the Bureau, proved fairly productive, yielding 12,550,000 eggs, and had a suitable boat been available it is believed the collection there would have been several times larger. Under existing conditions the eggs had to be hauled many miles overland, then shipped by rail to Kingston, Canada, and from there to the hatchery by boat, notwithstanding the fact that the fishery is only 20 to 25 miles distant from Cape Vincent. The Bureau's share of eggs secured as a result of cooperative work with the State amounted to 12,048,000, and 4,280,000 were obtained from commercial fishermen in New York waters, bringing the total collections to 28,878,000, or sufficient for stocking the hatchery without resorting as in past years to the transfer of eggs from outside stations of the Bureau. Fair success was attained in hatching these eggs, and in making the distribution the 19,550,000 fry produced were equitably divided between the spawning grounds in Lake Ontario and the interior waters of New York.

In the course of the whitefish spawning season, which was coincident with that of the Lake herring, extending from November 10 to December 5, eggs of the latter species to the number of 115,575,000 were collected and hatched, yielding 82,550,000 fry for return to the

spawning grounds. Over four-fifths of these were taken in the vicinity of Sodus Point, N. Y., and more might have been secured there had hatching space for handling them been available.

In connection with the propagation of commercial fishes, the usual numbers of young brook and rainbow trouts were hatched at Cape Vincent, the eggs having been furnished from outside sources.

In advance of the spawning of the pike perch in April, trap nets for the capture of brook fish were set in the Oswegatchie River within the corporate limits of Ogdensburg, N. Y., with the intention of conducting spawning operations in cooperation with the New York fisheries authorities. However, for some unknown reason, the catch of fish was only about one-third as large as last year, when operations were conducted on the same stream. This resulted in a proportionate decrease in egg collections, the total deliveries at the hatchery amounting to only 21,312,500, or less than one-third the number obtained in 1916. The fry hatched numbered 10,875,000, and after providing for a proper return to the spawning grounds the remainder were shipped to applicants in New York and Pennsylvania.

During the spring of 1917, 31,350,000 yellow-perch eggs were collected from brood fish obtained by setting nets in the river near the hatchery and 26,000,000 were hatched. With the exception of 250,000, which were used to fill applications, all of the fry resulting from this work were returned to the river.

The experience of recent years having demonstrated that pike-perch propagation could be more successfully and economically conducted on the shores of Lake Champlain than at the established location on the Missisquoi River, steps were taken early in the fiscal year to take down the Swanton hatchery and rebuild it on a selected site at Sandy Point, on Missisquoi Bay. All of the old material was utilized in the new construction, which was erected on a cement foundation and provided with a cement floor into which two large fry receiving tanks were built. The hatching capacity of the new building was increased by about 100 jars, and an abundant water supply by pumping was arranged for by extending the suction pipes directly into the lake. As funds were not available for completing the hatchery in all its details, only such part of the construction was planned for as would permit of the propagation of pike perch during the spring, with the view of adding the finishing touches later on.

The cold, backward spring and the presence of ice in the lake and river about one month later than usual were mainly responsible for the poorest spawning season that has been experienced in this region for some years. Such conditions have always been found to seriously curtail the run of spawning pike perch, this being especially noticeable in 1913, when practically no females entered the river. That year, however, they were taken from the lake, but during the past spring the fish did not seem to congregate on the lake spawning grounds at all.

In the belief that the old method of securing a brood stock from commercial fishermen entailed more expense than necessary, the station superintendent engaged the services of an expert web worker from the Lake Erie field for the construction of a trap net, to be operated by the station force. After a trial it was decided that the net could not be worked in the river successfully owing to its frequent

obstruction by floating débris. An effort was then made to operate it on a flat at the mouth of the stream, and here a considerable number of brood fish were taken. As a result of the season's experiments with this net it was decided to construct several more on the same lines, equip them with proper leads, and depend upon this method in the future for securing a brood stock, arranging for their operation in close proximity to the hatchery. Only 39,150,000 eggs were taken, and the percentage of hatch was somewhat below the average. However, this is not attributed to the poor quality of the eggs, but is believed to have been wholly due to the imperfect and untried conditions encountered in the new location. A few fry were retained for filling local applications, but the bulk of the output was planted near the station in Missisquoi Bay.

The collection of eggs was deemed too small to warrant the resumption of the field hatching operations inaugurated last year at Burlington, Vt. In lieu thereof the State Fish Commission undertook collections from the Lamoille River with equipment loaned by the Bureau, and the 32,500,000 eggs secured were eyed in the Sandy Point hatchery and then transferred by the State authorities to Burlington to be hatched and distributed locally in Lake Champlain waters.

After completing the collection of pike-perch eggs, 20,000,000 eggs of the yellow perch were taken for filling applications. The applicants for this species were so scattered that it was found impracticable to supply all of them during the short period that fry were available. Therefore a certain proportion of the fish were placed in a small pond at St. Johnsbury station, with the view of forwarding them to the more distant applicants in connection with the black-bass distributions later in the season.

PROPAGATION OF MIGRATORY FISHES OF THE ATLANTIC RIVERS.

The results of the shad season on the Potomac River were decidedly encouraging, there being a fair catch of fish and an abundance of eggs of good quality available for hatching. On the other hand, the efforts put forth at the Edenton (N. C.) station were practically fruitless, the collection of shad eggs being the smallest in the history of the Bureau's work in that region.

In advance of the shad hatching season the Bryans Point station was engaged in the propagation of yellow perch. In preparation for that work, 25 live cars were anchored in the mouth of a convenient creek for the reception of a brood stock, which was obtained by making daily visits to the nets of the commercial fishermen operating in neighboring streams and purchasing all available specimens. In this way 14,874 were acquired during March and installed in the live cars, where eggs to the number of 141,740,000 were dropped and bailed up for development in hatching jars between March 23 and April 3. Having finished spawning, the brood fish were released in local waters. The crop of eggs produced 130,370,000 vigorous fry for return to the spawning grounds.

During the mild weather of early April, shad appeared on the spawning grounds in numbers, and the fishermen made good catches until April 8. From that date until April 15 cold and stormy weather prevailed, and the water temperature dropped from 53° F., April 1 to 44° F., April 10. On April 17, when the temperature rose to 54° F., the catch was again good and the first eggs of the season

were taken. Two days afterward vigorous collecting efforts began, and were sustained to the close with average collections for the last 12 days of April closely approximating 4,000,000 eggs, the month's aggregate being 47,196,000. Despite the fact that high northwest winds prevailed during May and the water temperatures were rather low for successful work, the daily average of egg collections for the month was 1,225,000, and the total for the season amounted to 77,580,000, exceeding last year's total by nearly 15,000,000. Of this product, 1,899,000 eggs were transferred to the Washington aquarium of the Bureau for an exhibit, and from the remainder 68,665,000 fry of good quality were hatched and liberated on the Potomac River spawning grounds. The relatively large fry production was made possible by delaying the measurement of the eggs until the second day after their installation in the hatchery, thereby eliminating at the outset virtually all that were infertile, injured, or otherwise defective. The egg-collecting period ended on May 25, and the work of planting the fry, dismantling and storing equipment, and closing the hatchery was completed by May 31.

During the early part of the fishing season in Albemarle Sound, the prospects were favorable for one of the best runs in many years, but as it turned out very few fish reached their spawning grounds in its upper reaches and the Edenton station experienced one of the poorest years in its history. The sound was monopolized throughout the shad-spawning season by pound-net fishermen, practically none of whom were willing to cooperate with the Bureau in its efforts to save eggs. It is customary for these men to fish their pounds during the morning hours, and as the bulk of their catch is herring, it is necessary that the nets be hauled at frequent intervals and the fish prepared for salting. When requested to fish during the hours from 4 p. m. to midnight they objected on the ground that no labor would be available during those hours for dressing their herring. Only 7,625,000 eggs were taken and 6,060,000 fry hatched.

While satisfactory cooperation of the fishermen was lacking, the second year of white-perch propagation at Edenton station was an improvement over the first attempt, the egg collections aggregating 41,925,000 and the fry production 32,625,000.

There was increased cooperation on the part of the fishermen at the striped-bass auxiliary of the Edenton station, at Weldon on the Roanoke River, and the operations were highly successful as compared with results of former seasons. The first eggs were gathered April 23. Rising water, in conjunction with cold weather on May 5, arrested collections from that time until May 17, after which some eggs were taken daily until May 24, when the river had become so low and clear that the fish departed for deep water and the work had to be discontinued.

A feature of the work in this field was the holding of male fish in boxes at a midway river point for use when eggs were found and only females caught. Over a third of the eggs collected were saved through this arrangement. The egg collections for the season numbered 19,049,000, which yielded an output of 16,137,000 fry for return to the spawning grounds in the Roanoke River.

The second year's effort to hatch shad at auxiliaries of the Orangeburg (S. C.) station on the Edisto River was a failure so far as actual numbers were concerned. While there was no scarcity of adult fish,

very few were caught in a spawning condition. Between March 15 and April 30 the production of fry at the Jacksonboro field hatchery amounted to 145,000 and at Branchville 125,000; both lots were liberated on the spawning grounds in the Edisto River.

The propagation of Atlantic salmon at the Craig Brook (Me.) station was prosecuted to the same extent and along the same lines as heretofore. At the beginning of the year 968 wild adults of this species, purchased during the preceding two months, were being carried in the station inclosure awaiting the development of their eggs. By spawning time in October the number had shrunk through losses in the pound to 887, of which 491 were females. From this stock 3,739,180 eggs were secured, 3,404,258 fry hatched, and 3,028,858 young fish distributed, the discrepancies in the numbers showing the losses sustained through the incubation and fry stages. The entire output of this species was liberated, as formerly, in tributaries of the Penobscot River, the distribution occurring in May. At the close of the fiscal year 835 adult fish to be used as a brood stock for next season's supply of eggs were on hand in the station inclosure.

During May and June 28,250,000 smelt fry were produced at the Green Lake station, the eggs having been derived from a run of brood fish in the vicinity. The output would no doubt have been much larger had not a cold heavy rain occurred just at the beginning of the spawning season, reducing the temperature in the brooks and causing the run of fish to drop back into the lakes below, where many of them were badly bruised on the sandbars in their attempts to spawn. Fifteen million eggs were taken from a second run, and the remainder of the collections were gathered on the gravel beds where the fish had congregated in the lakes. In making the distribution preference was given to waters in the State which the Maine fisheries authorities are especially desirous of stocking.

A shipment of humpback-salmon eggs forwarded from the Afognak (Alaska) station arrived at the Craig Brook and Green Lake stations on November 17. The eggs laid down at the former, numbering 4,096,000, were in fine condition and the fry hatched from them were liberated in March in tributaries of the Penobscot, the entire loss on both eggs and fry during the time they were held amounting to only 134,561. Excellent results were also attained with the Green Lake assignment. From the 4,106,752 eggs received fry to the number of 3,950,150 were hatched and distributed, the rivers selected for the plants being Dennys, St. Croix, East Machias, Narragaugus, and St. George, all of them coastal streams in the State of Maine.

OPERATIONS OF THE INTERIOR STATIONS.

The total number of trout produced for distribution for the fiscal year, including brook, blackspotted, and rainbow, amounted to 25,411,669, or an excess of 2,298,227 over the output of those species in 1916.

The brook-trout operations at Leadville station were unusually successful, both as to the number of eggs taken and the results attained during the hatching and distribution period.

The hatchery at Berkshire, Mass., recently donated to the Bureau, yielded an output of 256,995 brook trout, 179,995 of which were fingerlings.

The stations showing increased production of brook trout over last year were those at Cape Vincent, Clackamas, Duluth, and Nashua. Some losses occurred at the Erwin station owing to the poor quality of eggs obtained from commercial dealers.

At the Hornbrook auxiliary of the Baird (Cal.) station, 205,650 rainbow-trout eggs were collected from wild spawners during the spring.

In an effort to improve the brood stock of rainbow trout at eastern stations of the Bureau, a consignment of eggs from wild fish, of extra large size, was forwarded from collecting fields in the vicinity of Bozeman to Wytheville during the spring, with the view of distributing the resulting fry to the various rainbow stations in the East to be reared for breeders.

There was an aggregate output of 10,250,465 basses, crappies, sunfishes, and catfishes, this being a slight increase over the 1916 distribution. The yield of black bass was greatly curtailed at a number of stations by cold weather during the spring which caused the brood fish to abandon their nests.

The closure of the San Marcos station, owing to the failure of the Texas Legislature to enact legislation favorable to the Bureau's work in that State, reduced the output of the station from 370,925 in 1916 to 90,656 in 1917.

At the Bullochville (Ga.) station a half-acre pond was treated with quicklime in March for the purpose of stimulating aquatic plant life, so essential in pond cultural operations. Brood fish to the number of 56 nested in the pond thereafter, and it is believed that the experiment will have a favorable outcome.

At Odell and Meadow Creeks field stations, in Madison Valley, Mont., 995,000 rainbow-trout eggs were collected during April and May, and in May and June eggs of the grayling to the number of 2,800,000 were secured. This work was seriously hampered by high water, which permitted the fish to escape from the main channels of the streams into numerous small rivulets, where they were inaccessible for propagation. As a consequence egg collections of both species were greatly curtailed as compared with past seasons. After providing for the return to the spawning grounds of a sufficient number of fry for the maintenance of the stock therein, the balance of the eggs were shipped, some as eyed eggs on assignment, and some to the Bozeman station with the view of utilizing the product in filling applications for young fish.

The spawning season of the blackspotted trout in the Yellowstone National Park ordinarily extends from the latter part of one fiscal year into July or August of the next, the fish on the west side of Yellowstone Lake usually spawning during June and on the opposite side in July. During July, 1916, the egg collections in this region aggregated 7,400,000, all of which were taken from fish that had ascended tributary streams to spawn. The fish were seined from below racks or barriers that had been installed for their interception, and held in live cars for ripening. All of the eggs were eyed in the park hatchery and then transferred, part to various stations of the Bureau, and part to various State fish hatcheries. In the spring of 1917 the work was resumed, and eggs amounting to 440,000 were secured from the Soda Butte field.

PROPAGATION OF MARINE SPECIES.

Taken as a whole, the output of the marine stations exceeded that of 1916 by more than half a billion fish and eggs. Owing to conditions over which the Bureau had no control, the volume of the lobster and cod operations was somewhat lessened in comparison with the previous year, but the shortage in that direction was compensated for by the largely increased production of pollock and flatfish.

On account of the limited funds available and the excessively high cost of lobsters, only 14,660 adults were purchased as a source of egg supply for the Boothbay Harbor station, this being a smaller stock by several thousand than had usually been secured for that purpose. The lobsters were acquired and installed in the pound between July 1 and September 30, and during succeeding months they received the close attention of a caretaker who fed them regularly, maintained a uniform water temperature in warm weather by opening and closing the gate valves of the pound at a specified time each day, and guarded against pollution by the removal of all débris from the inclosure at frequent intervals. In April the stock which was in the pound was transferred to live cars at the hatchery until the lobsters could be relieved of their eggs, after which they were turned over to the Maine Department of Fisheries.

Those surviving confinement amounted to 10,976, or nearly 75 per cent of the original number, which shows merely an average loss, considering the long term of confinement to which they were subjected. It was found there had been an appreciable loss of eggs through premature hatching in the pound, and there were indications that some of the barren lobsters had been stripped by eels, notwithstanding the vigilant efforts made to prevent this by the regular setting and tending of baited eel traps. In the course of the year many large eels were caught in this way, but it was impossible to capture the small ones. On account of the losses mentioned, only 104,445,000 eggs were realized, the average per lobster being 9,516, or slightly less than that of last year. The percentage of eggs hatched was 98. The fine quality of the fry is justly attributable, in part, to the adoption of large, flat, wooden baskets for removing them from the pound, thus reducing the amount of handling that has heretofore been required. In the future it is intended to use these baskets exclusively, not only when unloading the pound but when making transfers thereto. During the spring months all available "seeders", amounting to 237, were purchased and from this source 5,615,000 additional eggs were obtained.

On March 1 fyke nets were set in waters adjacent to the Boothbay Harbor hatchery, and from that time to the close of April the force was busily engaged in acquiring a brood stock of flatfish. To this end new fishing grounds were resorted to, and extended collections were made in Casco Bay and farther westward by means of the station steamer. The total number of brood fish obtained from all sources amounted to 7,775; these yielded 1,085,326,000 eggs from which 966,266,000 fry were hatched, a percentage of 89. The fry were liberated in the usual manner, and in waters near where the fish had been caught.

As in past years an experimental shipment of pollock eggs was made from the Gloucester station by means of the steamer *Gannet*,

which was equipped for the purpose with jars, cans, and other apparatus. The trip was completed December 11, on which date 7,381,000 live eggs, out of an original consignment of 34,430,000, were delivered at the station. In connection with this shipment, and also those made on previous occasions, every possible attention had been given the eggs en route; the water was changed at frequent intervals, and the eggs were packed and handled by different methods. In view of the extremely poor results attained, it can only be concluded that it is not practicable to transport long distances such delicate, sensitive eggs as those of the pollock. From the eggs received only 3,346,000 fry were obtained for distribution.

During the fall the superintendent purchased a carload consignment of 6,420 lobsters, had them prepared under his direction for transfer to the Pacific coast, and personally accompanied the shipment. The trip across the continent consumed less time than in former years, and the results were very encouraging, there being a loss of less than 10 per cent and all of the survivors being liberated in most excellent condition.

At the beginning of the fiscal year, comparatively small numbers of lobster and mackerel eggs were undergoing incubation at the Gloucester station, and additional collections of these species and of the butterfish were obtained, hatched, and distributed during July.

Pollock propagation was undertaken on November 1, 1916, under conditions which it was feared would greatly handicap the work. The schooner *Grampus*, whose crew had for 20 years acted as spawn takers for the station, was assigned to other duty, making it necessary to train a new force of men to take spawn. The results of this change were noticeable at first, but by the time eggs were available, in large numbers, the character of the work of the new men had materially improved. Between November 1 and January 27, 2,081,000,000 eggs were taken, and during the height of the season, in December, when the daily collections frequently reached from 50,000,000 to 100,000,000, and on one occasion to 161,000,000 eggs, the hatchery became so crowded that it was necessary at times to plant the oldest eggs in the house to provide room for new acquisitions. The total number disposed of in this manner aggregated 614,530,000, all of which were deposited in open waters off Cape Ann. One shipment of 34,430,000 was forwarded to Boothbay Harbor station and the remainder produced 856,220,000 fry, which were distributed along the Massachusetts shore from Rockport to Marblehead. From the close of the pollock season, near the end of February, the weather was too cold for successful egg collections. During that period Gloucester Harbor was completely frozen over for several days as far as the breakwater at its entrance, and as the station was short of fuel the entire force, including the spawn takers, was utilized in carrying coal from Rocky Neck to the hatchery, using an old sleigh and small hand sleds for transporting it over the ice.

Between February 27 and April 13, 1917, 92,340,000 cod eggs were taken at Gloucester, yielding 62,790,000 fry, which were planted in adjacent waters. In addition 3,820,000 cod fry were developed from a shipment of eggs forwarded to Gloucester from the Woods Hole station, during a period of congestion in that hatchery. Egg-collecting operations were seriously curtailed during March and April by the spring freshets. Cod eggs in abundance were available at

that time, but the sea water all along the New England coast, for 15 to 25 miles offshore, was freshened to such an extent that very heavy and sometimes total losses occurred when eggs were carried in it. The haddock as well as the cod were affected by it, and many of the haddock eggs died in transit to the station. The total collections of haddock eggs were 10,820,000, which yielded an output of 6,720,000 fry.

Practically all of the 340 brood flatfish secured for the station were taken in fyke nets set during March in Gloucester Harbor, the attempts to obtain additional supplies in Ipswich Bay and in the vicinity of Salem being unsuccessful. From this stock 191,250,000 eggs were derived and 169,660,000 fry were hatched and planted, the distributions being made in the harbors and coves of Ipswich Bay and Massachusetts Bay.

Active fish-cultural operations for the season at the Woods Hole station began with the acquisition of the first lot of brood cod, on November 21, and from that time until December 1 purchases of these fish aggregating 3,155 were made daily from commercial fishermen. This appeared to be the best brood stock the station had had for several years, but from a fish-cultural standpoint it proved to be disappointing, as the number of males and barren females contained in the lot was disproportionately large, resulting in a smaller yield of eggs by 48,000,000 than that of the previous year, and a reduction of 23,000,000 in the output of fry. Eggs to the number of 238,630,000 were obtained from these fish between November 28 and February 25; the height of the spawning season occurred in December. On one occasion during December the hatchery became overcrowded, necessitating the transfer of a consignment of 6,810,000 eggs to the Gloucester station for development. The losses sustained in hatching aggregated 61,642,000, or about 26 per cent of the stock retained. After having finished spawning, the surviving brood stock, numbering 2,648 fish, were liberated on March 1. The distribution of the fry extended from December to March, inclusive.

In advance of the flatfish spawning season, additional hatching equipment was constructed, with the view of increasing the output of this species over that of last year. However, this proved to be impossible owing to the difficulties encountered in securing a brood stock. Before fyke nets for the capture of this fish could be installed in Waquoit Bay, ice 7 inches in thickness had to be sawed out, and a second sawing was necessitated in order to effect their removal. In other places floating ice, shifted by wind and tide, covered the nets and rendered them inaccessible. The collections at Menemsha Pond were greatly hampered by scarcity of fish, despite the fact that more were available at that point last year than could be accommodated at the Woods Hole hatchery, and some 500 barrels of flatfish were taken from the pond by commercial fishermen.

The effort to obtain brood flatfish in Narragansett Bay met with a larger measure of success than at either of the other fisheries, notwithstanding the operations were materially interfered with by the high winds, which not only put many of the nets out of commission but caused the loss of approximately 60,000,000 eggs by washing them out of the live cars where the brood stock had been stored. From all three fields 2,787 male and female fish were taken. Although strong

winds were quite prevalent during the hatching season, they were not from a direction that causes extremely roily water in the harbor. The losses during the incubation period were therefore light as compared with some years when more favorable conditions have been encountered, and from the 856,002,000 eggs realized 678,770,000 fry, or 79 per cent, were hatched.

RESCUE OF FISHES FROM OVERFLOWED LANDS.

The rescue of food fishes from temporary ponds and sloughs bordering the Mississippi and Illinois Rivers was vigorously prosecuted in the fields formerly operated near Bellevue and North McGregor, Iowa; Homer, Minn.; La Crosse, Wis.; Meredosia, Ill.; and Friar Point, Miss.; and a new collecting base was established at Galena, Ill., the returns from which were very encouraging.

Warm weather in August and early ice formations in November shortened the season in the upper Mississippi River, while operations at Meredosia were hampered by high-water stages in the Illinois River during July and August, at the very time when this work can usually be prosecuted to best advantage. Another unfavorable feature at this station was the excessive heat almost daily in July, which made the handling of the rescued fish very difficult. Owing to these conditions the aggregate collections of 8,818,160 at all points were about 3,000,000 less than those of the preceding year. As in past years, the majority of the rescued fishes were returned to the main river channels, and a limited number were used to supplement the black-bass distributions from the pond-fish cultural stations of the Bureau.

The salvaging of fishes from the overflowed lands can and should be very greatly extended throughout the Mississippi Basin. The comparatively slight attention given to the matter by the States emphasizes the necessity of Federal aid in ameliorating or preventing the enormous annual losses to which the best food fishes of the region are subject.

PLANTS IN CONNECTION WITH FISH-CULTURAL EXPERIMENTAL WORK.

In addition to the work of mussel propagation carried on by the fisheries biological station at Fairport, Iowa, experiments of a practical nature relating to the propagation and rearing of useful fishes are also conducted. The result is the production of large numbers of fishes, not all of which are required in experimental work, the surplus being liberated in public waters, usually in the vicinity of Fairport. The following table gives the number of each species distributed in 1917 and the age at which planted. These figures are included in the general tables of distribution which appear elsewhere.

Species.	Fry.	Fingerlings.	Total.
Largemouth black bass		3,525	3,525
Sunfish		45,137	45,137
Crappie		18,300	18,300
Buffalofish	6,750,000		6,750,000
Carp	112,000		112,000
Catfish		141	141
Total	6,862,000	67,103	6,929,103

ACCLIMATIZATION.

In continuance of the attempt undertaken four years ago to acclimatize the humpback salmon in eastern waters and to establish an annual run of that species in Puget Sound, 16,000,000 eggs which had been collected near Afognak, Alaska, were forwarded from that point during the fall of 1916. On arrival at Seattle, about half of the consignment was reserved for development at the Birdsview, Quilcene, and Duckabush stations. The remainder of the eggs were shipped to Maine, arriving there November 17, and were divided between the Green Lake and Craig Brook stations. They were hatched at both stations with merely nominal losses, and the fry were distributed, in excellent condition, in the coastal rivers of Maine; points of deposit as near the headwaters of tributary streams as possible being selected for their liberation, the object being to guard against the destruction of the young fish by entrance into brackish water before reaching a suitable age. The eggs retained at the coast stations were also successfully hatched and planted.

A number of years ago the Bureau began the annual shipment of eastern lobsters to the State of Washington, in the hope of being able to establish this valuable crustacean in Puget Sound waters. In pursuance of this undertaking, a carload consignment of 6,420 adult male and female lobsters was forwarded from Bath, Me., to Anacortes, Wash., in November, 1916. This proved to be the most successful shipment of the kind that has so far been made, the total losses en route being less than 10 per cent. The lobsters, in excellent condition, were planted soon after arrival in the vicinity of Rosario, Orcas Island, one of the San Juan group.

In November, 1916, a lot of eyed eggs of the ayu, or dwarf salmon, which had been forwarded through the courtesy of the Japanese Government, was received at the Birdsview (Wash.) station. These eggs, which are very small and somewhat adhesive, were transported in water. En route more than 50 per cent had hatched, and the fry, as well as most of the remaining eggs, were dead. The few live eggs hatched within a short time after being removed from the hatching boxes, but as the station had no equipment for handling such small fry, they quickly passed through the smallest mesh material available, and no opportunity was afforded to observe them.

RELATIONS WITH THE STATES.

The Bureau's constant aim and practice are to cooperate with the fishery authorities of the various States in every feasible manner. This cooperation is most widely exhibited in the matter of providing fish eggs for incubation in the State hatcheries, the resulting young to be distributed under State auspices, and of furnishing young fish to be similarly planted.

A list of the States to which, on request, the Bureau, in 1917, supplied fish eggs and fish of the species and in the numbers indicated follows.

ASSIGNMENTS OF FISH EGGS AND FISH TO STATE FISH COMMISSIONS, FISCAL YEAR 1917.

State and species.	Eggs and fry.	Fingerlings, yearlings, and adults.
California: Chinook salmon	7,027,300	
Illinois:		
Black bass		7,000
Brook trout	50,000	
Catfish		10,500
Crappie		300
Pike perch	15,000,000	
Rainbow trout	50,000	
Sunfish		4,000
Whitefish	5,000,000	
Yellow perch		250
Indiana: Pike perch	15,000,000	
Iowa:		
Brook trout	50,000	
Lake trout	100,000	
Pike perch	40,000,000	
Kentucky:		
Black bass		88
Chinook salmon		6,000
Crappie		2,800
Pike-perch fry	5,000,000	
Rainbow trout		10,000
Rock bass		1,050
Sunfish		4,200
Maine:		
Brook trout	100,000	
Lake trout	200,000	
Landlocked salmon	401,000	
Massachusetts: Catfish		12,500
Michigan:		
Grayling	50,000	
Lake trout	8,640,000	
Pike-perch eggs	40,000,000	
Pike-perch fry	2,000,000	
Whitefish fry	250,000	
Minnesota:		
Lake trout	3,300,000	
Steelhead	200,000	
Whitefish	122,500	
Missouri: Rainbow trout	98,400	
Montana:		
Black bass		7,500
Blackspotted trout	400,000	
Catfish		2,000
Rainbow trout	150,000	
Whitefish	300,000	
Nebraska: Pike perch	9,800,000	
Nevada: Brook trout	150,000	
New Hampshire:		
Brook trout	50,000	
Landlocked salmon	25,000	
Rainbow trout	100,000	
New Jersey:		
Rainbow trout	50,000	
Smallmouth black bass		1,500
New Jersey—Contd.		
Steelhead	100,000	
New York:		
Lake trout	5,490,000	
Landlocked salmon	25,000	
Pike-perch fry	6,600,000	
Steelhead	500,000	
Yellow-perch fry	250,000	
North Dakota:		
Pike perch	3,000,000	
Steelhead	100,000	
Ohio:		
Lake trout	600,000	
Pike perch	73,600,000	
Whitefish	40,980,000	
Oklahoma:		
Black bass		70
Catfish		10
Rock bass		80
Sunfish		90
Yellow-perch fry	100,000	60
Oregon:		
Blackspotted trout	250,000	
Blueback salmon	2,000,000	
Chinook salmon	163,900	60,000
Lake trout	1,000,000	
Silver salmon		10,000
Steelhead	1,687,600	
Pennsylvania:		
Lake trout	1,000,000	
Rainbow trout	50,000	
Pike perch	8,000,000	
South Dakota:		
Blackspotted trout	30,000	
Brook trout		23,150
Pike perch	3,000,000	
Utah: Blackspotted trout	100,000	
Vermont:		
Channel catfish		100
Lake trout	1,500,000	
Landlocked salmon	40,000	
Steelhead	200,000	
Washington: Blackspotted trout	200,000	
Wisconsin:		
Lake trout	13,000,000	
Whitefish	5,000,000	
Wyoming:		
Blackspotted trout	300,000	
Lake trout	200,000	
Rainbow trout	100,000	
Steelhead	100,000	
Total	[a] 322,930,700	163,248

[a] Includes 14,230,000 fry.

The Minnesota Game and Fish Department donated 25,000,000 pike-perch eggs which were consigned to the Duluth station.

CLOSURE OF FISH HATCHERIES.

During the year the Secretary, acting under the mandatory provisions of law, has closed two fish hatcheries, located at Havre de Grace, Md., and San Marcos, Tex. The Secretary's action in each case was based on the recommendation of the Commissioner of Fisheries, and no date was set for reopening the stations.

The conditions which necessitated the closing of the Battery shad hatchery at Havre de Grace, at the mouth of the Susquehanna River, are set forth in a report by the Commissioner to the Secretary on January 27, 1917, from which the following extracts are taken:

The possibility that the Bureau might be driven to this step has been appreciated by you for nearly four years. Each season in that period the condition of the fisheries at the mouth of the Susquehanna has been taken under consideration with reference to our fish-cultural work. In annual reports, in special reports to members of the legislature, in communications to the governor, in press notices to the fishermen and the general public, and in personal statements and appeals, we have shown the necessity for a radical change of policy on the part of the State of Maryland in order that the further depletion of once valuable fisheries might be arrested and the abundance of important food fishes might be restored and maintained. Nothing has been done to improve the situation. The State continues to permit practices known to be inimical to the best interests of the fisheries and directly antagonistic to the efforts of the Bureau of Fisheries in behalf of the people of the State. The future expenditure of effort and money under the circumstances is not only inadvisable and unjustified, but is clearly forbidden by the following stipulation which Congress has wisely placed on our annual appropriations for the propagation of food fishes:

"No part of the appropriation herein for propagation of food fishes shall be expended for hatching or planting fish or eggs in any State in which, in the judgment of the Secretary of Commerce, there are not adequate laws for the protection of the fishes."

The Government has been conducting shad-cultural operations at Havre de Grace since 1877, and has occupied the present site since 1880. Owing to its favorable location and the cordial cooperation of the fishermen, the hatchery was able to save the spawn of a very large percentage of the ripe shad caught for market, and the output season after season tested the full capacity of the plant. In fact, this hatchery has a record of young shad produced that is not approached by any other; and the abundance of fish was assured year after year, notwithstanding an enormous catch. Gradually the methods of fishing have undergone a change and there has arisen a new generation of fishermen apparently indifferent to the needs of the shad, forgetful of their own interest, disinclined to cooperate with the Government, and insisting on the use of methods that are contrary to the interests of the State and of its people. The legislature, with the weight of evidence and testimony available regarding the obnoxious fishing methods, would be justified in summarily suppressing them as a nuisance; they remain unaltered. There is thereby placed on the Federal Government a task that yearly becomes more difficult, more expensive, and more unsatisfactory to all persons having the welfare of the fisheries and the fishermen at heart.

In the earlier years cited, the average cost of collecting and hatching shad eggs at Havre de Grace was well under $100 per million. In 1915 the cost exceeded $1,940 per million, and during the past three seasons has averaged $1,216 per million, or more than twelve times the former cost.

The entire history of the hatching operations on the Susquehanna shows that the Bureau has spared no effort and expense to aid the fisheries and maintain the supply of Maryland's most important food fish. I would favor the resumption of our operations as soon as the State gives evidence of a due appreciation of the Government's work by the enactment of laws placing proper restrictions on the fishing.

The situation at San Marcos was somewhat different from that at Havre de Grace in that two stipulations imposed by Congress in relation to the fish-cultural work of the Bureau were being violated. The matter was formally presented by the Commissioner to the Secretary in May, 1917, and the Secretary thereupon issued a closing order, accompanying it with a public statement from which the following is an extract:

It is with deep regret that I have been obliged to close the fish-cultural station at San Marcos, Tex., because of the failure of the State to meet the conditions imposed by Congress. These conditions are (1) that the State shall afford proper protection to the fishes cultivated and (2) that the Commissioner of Fisheries and his duly authorized agents shall be accorded the right to conduct fish-cultural work and all operations connected therewith in such manner and at such times as they may regard as necessary and proper.

The principal fish cultivated at the San Marcos station is the largemouth black bass, the most important of the fresh-water fishes of Texas. The Department has for

years been calling the attention of the State to the fact that this species is not protected during the spawning season, but may be caught and killed even when the parent fish are on their nest guarding their eggs and defenseless young. Such disregard for the elemental needs of the fish nullifies the work of the Bureau of Fisheries and indicates an indifference to the future welfare of the fisheries and fish supply that is in strong contrast to the attitude of other States. The necessity for amending the local fish laws was actively urged on the State by the Department during the years 1915, 1916, and 1917, is acknowledged by the State fishery officials, has been pointed out by numerous public-spirited citizens, and has received the favorable consideration of committees of the State legislature. At the recent regular and extraordinary sessions of the legislature strong representations were made to the legislature and the governor by citizens, by Department officials, and by members of the Texas delegation in Congress, but the legislature failed to act.

The other phase of this matter was (*a*) the assertion by the Bureau of the supposed right to take fish for brood purposes, rearing, and distributing, from the head of the San Marcos River, in accordance with a distinct agreement with the local utilities company, that controlled the water and with a citizens' committee which acted for the town of San Marcos, at the time the station was located there in 1893; and (*b*) the recent denial by the townspeople and the local legal officers of the right of the Bureau's agents to take fish from the shut-off head of the San Marcos River that, from the very outset, had been regarded as a part of the station's nursery system. Fortified by an opinion of the attorney general of Texas, the local county attorney gave notice that the continuance of operations in the water in question would be followed by prosecution of the Bureau's representatives. The Bureau could not consent to abandon operations it regarded as rightful nor to subject its employees to arrest, imprisonment, and possible fine and conviction, for carrying on disinterested work in behalf of the State, so the discontinuance of the station was the only logical procedure.

ARTIFICIAL PROPAGATION OF FRESH-WATER MUSSELS.

The usual work in the propagation of fresh-water mussels was carried on at various points in the Mississippi Basin under the supervision of the fisheries biological station at Fairport, Iowa. By means of this work, together with well-regulated protective measures, it is expected to perpetuate the supply of commercial mussels.

During the year a total of 252,486,200 mussels in a condition of parasitism on fishes were planted in suitable waters, as compared with 331,451,490 for the preceding year. This decrease was due to very unfavorable river conditions and to an unprecedented scarcity of ripe mussels. While an abundance of female mussels with eggs was available, it was not until very late in the season that many "river muckets" sufficiently ripe for the work could be obtained.

Five species of commercial mussels were propagated in 1917, of which the principal ones were the common mucket and the Lake Pepin mucket. The inoculated fish hosts were liberated in the Mississippi River off Fairport and in Lake Keokuk, Iowa; in Lake Pepin, Minn.; in the Black and White Rivers in Arkansas; and in the Cumberland River in the vicinity of Kuttawa, Ky.

The actual cost of production was 2.72 cents per thousand, but if allowance is made for overhead charges the cost per thousand was 3.73 cents. In connection with this work 57,839 adult and 921,915 fingerling fish were reclaimed from landlocked ponds in the over-

flowed lands and returned to public waters. Of the number of fish rescued 110,603, or approximately 11 per cent, were infected with larval mussels. The total number of fish handled was 2,039,018.

The following table shows the details of this work:

MUSSEL PROPAGATION IN THE FISCAL YEAR 1917—POINTS OF DEPOSIT AND SPECIES OF GLOCHIDIA USED FOR INFECTION.

Species of mussel.	Cumberland River, Ky.	Arkansas.		Mississippi River.			Total.
		White River.	Black River.	Lake Keokuk, Iowa.	Lake Pepin, Minn.	Fairport, Iowa.	
Pocketbook (*Lampsilis ventricosa*)						1,820,000	1,820,000
Mucket (*Lampsilis ligamentina*)	4,699,000	15,432,700	34,072,500			76,805,500	131,009,700
Lake Pepin mucket (*Lampsilis luteola*)				12,639,900	106,662,600		119,302,500
Yellow sand-shell (*Lampsilis anodontoides*)		34,000				213,000	247,000
Butterfly (*Plagiola securis*)		107,000					107,000
Total	4,699,000	15,573,700	34,072,500	12,639,900	106,662,600	78,838,500	252,486,200

SURVEYS, INVESTIGATIONS, AND EXPERIMENTS.

GENERAL ASPECTS OF THE WORK.

In biological work the year has been marked by substantial readjustments. These have arisen partly from enlarged responsibilities and opportunities coming with an increase of personnel, partly from the fact that some of the investigations have progressed to a stage justifying or requiring a rearrangement of plans, and partly from the conditions of national exigency. On the whole, the changes and the new undertakings have the effect of concentrating the efforts of the Bureau upon problems of most immediate practical importance.

The climax which came in national affairs late in the fiscal year necessitated the directing of the usual laboratory and field investigations toward increased production of aquatic supplies, especially foods, and toward measures that conduce to a reduction in wasteful and destructive practices.

STUDIES OF MARINE FISHES.

The oceans, as the largest bodies of water, are and must always remain the greatest sources of food from fishes, and the studies intended to lay a proper foundation for the exploitation and control of marine fisheries are of very great importance. The conditions of study and the complexity of the problems are, however, of such a nature as to cause marine investigations to be relatively slow in the production of practical results. In the present circumstances, therefore, and with the lack of suitable available vessels, there has unavoidably occurred a temporary suspension of some investigations that it would have been otherwise highly desirable to continue.

The tuna investigation conducted off the coasts of southern California and Mexico has been continued throughout the year, with results which are not yet sufficiently definitive to admit of conclusions,

but which seem to indicate the delimitations of the areas of possible tuna fishery. At the close of the year plans were under consideration for a more adequate prosecution of this investigation in the hope and belief that another year would not pass without a definite and practical contribution to the solution of some of the principal problems now appearing as obstacles to a continuous and entirely successful prosecution of the tuna fishery and the industries dependent thereupon.

SURVEYS OF FISHING GROUNDS.

For a short period during the early winter of 1916–17 the *Grampus* was employed in surveying banks in the vicinity of Cape Fear of whose exact location, extent, and productivity the fishermen have been unaware. Unfavorable weather permitted the survey of but two grounds. The larger of these lies in 12 fathoms of water 9 miles southwest one-half south from the Cape Fear River entrance buoy, is easily found and will support an important fishery for sea bass or blackfish. The smaller ground, locally known as the "snapper bank," lies in from 12 to 13 fathoms of water $1\frac{1}{4}$ miles west southwest from the offshore light buoy 2A at the end of Frying Pan Shoal. It is entirely surrounded by a large area of scattered patches of rock and affords good fishing when a vessel is allowed to drift over it.

The investigations of the same vessel in the Gulf of Mexico later in the winter, although seriously interrupted by storms, fog, and other circumstances, yielded information valuable to the fishery interests of Alabama, Mississippi, and Louisiana. Shrimp were taken in abundance in the otter trawl on mud bottom, in 5 fathoms of water, off the entrance to Mobile Bay. In February experimental hauls off the southeast side of Ship Island, Miss., developed a productive area at least 4 or 5 miles long on which shrimps were found in abundance equal to the best fishing off Fernandina, Fla., but with a much smaller proportion of small fish and trash. Another ground producing large shrimp in abundance was found in 9 fathoms, on mud bottom, about 9 miles southeast of Barataria Pass, La. These results indicate that a productive winter fishery for these valuable crustaceans may be developed offshore on a considerable stretch of the Gulf coast.

OCEANOGRAPHY.

The same causes which have contributed to a temporary diminution of activity in studies of marine fishes led before the close of the year to the interruption of some of the important oceanographic investigations.

The *Grampus* was, however, able to make a series of observations beginning with a cruise from Gloucester, Mass., to Norfolk, Va., early in the fiscal year. The vessel then made a line of hydrographic stations from Cape Henry to the Gulf Stream and thence to Cape May, N. J. Going later to Gloucester, Mass., a few stations were made in the Gulf of Maine, whence she proceeded to Southport, N. C., for investigations of fishing grounds as already mentioned, and later to Key West. In the Gulf of Mexico the vessel cruised over the continental shelf (within the 100-fathom line) from Key West, Fla., to Aransas Pass, Tex.

Some oceanographic data have also been gathered in connection with the tuna investigation on the Pacific coast.

While the field work in the investigation of Chesapeake Bay closed during September, 1916, the detailed study of materials collected, which is necessary for the drawing of conclusions, remains to be finally completed; however, substantial progress has been made.

SHELLFISH INVESTIGATIONS.

Provided with a more adequate personnel for attention to the problems of the oyster industry, the Bureau has been able to set these investigations upon a basis promising and already yielding greater efficiency and more practical service to the oyster industries. A provisional field laboratory has been established at Milford, Conn., from which as a base the principal problems of the great oyster-planting industry on Long Island Sound and other waters are being considered. The problem of finding the conditions necessary to secure a regular "set" of oysters is given first place, although attention is given from that headquarters to other important matters, such as the destruction or damaging of oyster beds by the growth of the so-called "sand coral."

There has been cooperation with the Conservation Commission of Maryland in observational and experimental work on the growth of oysters in Chesapeake Bay. Through the Woods Hole laboratory further attention has been given to the study of green gill in oysters of Lynnhaven Bay and other localities, and studies of some importance have been addressed to the nutrition of oysters. The results of both of these latter investigations have been given out in published reports. The Bureau has continued to extend aid to the oyster investigations of Puget Sound undertaken in cooperation with the University of Washington.

Serious mortalities among oysters or injuries to oyster beds occurred during the year in regions remote from each other and from distinct causes in the several cases. Among these was the damage to oyster beds from "sanding," owing to the work of polychæte worms in building tubes of sand and overrunning, or even smothering, the oysters; it was most prevalent in Jamaica, Great South, and Hempstead Bays. The loss of large numbers of planted oysters in Chesapeake Bay was investigated and the results were made known to persons interested. On the west coast of Florida there occurred very serious losses of oysters resulting from the depredations of a turbellarian worm, locally but improperly known as a "leach." A less misleading and more appropriate name is that of "wafer," which is applied to a similar pest in New South Wales. This form had not previously been recorded as an enemy of oysters in this country.

Mortality among scallops in Maine was investigated and found to be attributable to the work of starfishes, which were made more abundant by the pursuit of improper practices in the scallop fishery. Appropriate recommendations were made.

Investigations relating to fresh-water mussels have been continued actively. Interesting progress has been made in experiments in rearing mussels under conditions of control since it has been found that mussels (Lake Pepin muckets) reared in confinement from artificial infections begin breeding at the age of little more than two years. A second generation is now being reared from parents which

were artificially propagated and reared in confinement. Studies and experiments indicate that the natural food of fresh-water mussels is made up principally of detritus, which is decayed or decaying animal and vegetable matter, and that vegetable matter is preferred to animal. Investigations completed just at the beginning of the fiscal year have shown also that fresh-water mussels have the power of absorbing nutriment in the form of fats (olive oil) and protein (egg albumen) directly from solution in the water and through the cells of the surface of the body (gills, mouth, palps, and foot). It was possible to determine that the fats, so taken up by the cells of the outer body walls, were transported through the circulatory system to the various parts of the body.

Considerable attention has been given to the matter of securing for the mussels proper protective legislation on the part of the several States. Under present conditions, the efforts of the Bureau to propagate fresh-water mussels are not supplemented as they should be by the extension of a reasonable measure of protection to the young mussels.

A study of the causes of pearl formation in fresh-water mussels has been brought to a stage of reporting. There has also been obtained during the year a valuable fund of information regarding the pearl fisheries and pearl culture in the Far East to which it is hoped to give publication within a reasonable time.

BIOLOGY OF THE BLUE CRAB.

A new investigation of the life history and habits of the blue crab, although begun only at the beginning of the fiscal year, has already made such progress as to supply the information most needed as a basis for the regulation of the fishery and the conservation of the blue crab, particularly in Chesapeake Bay, the headquarters of the world's greatest crab fishery.

The blue crab may spawn more than once. Crabs under observation have spawned twice in the same summer. The female crabs which are dredged during the winter are prospective spawners whether or not they have spawned during the preceding season. The life history of this species in Chesapeake Bay is, in brief, as follows:

Nearly all the young are hatched in the lower bay from the last of June to about the first of September. The great majority of the young begin a migration northward up the bay, settling on the bottom when cold weather comes and ceasing to feed or to shed. The next spring they resume development and their northerly migration. They reach maturity in Maryland waters, where mating occurs, principally during the last of July and August. Mating occurs only once during the lifetime of the female, but sufficient sperm is received and carried to fertilize two or more successive batches of eggs. The females then migrate southward to the lower part of the bay, while the males generally stay behind, spending the winter in deep water or in creeks and rivers. About 80 per cent of the adult crabs taken in the upper waters of the bay are males, and, correspondingly, about 80 per cent of the adult crabs taken in the waters near the mouth of the bay are females.

Some of the females lay a batch of eggs before or while going south, but probably the greater number lay no eggs until the following season. A certain small percentage of the young do not migrate up the bay but remain to develop and mate in the lower waters.

At the approach of cold weather the crabs settle to the bottom and are usually supposed to bury there, but it is probable that they simply lie dormant and occasionally move slowly over the bottom. Practically all females dredged during the winter, whether or not they had spawned previously, were found to contain eggs and the live sperm with which to fertilize them. There is no evident northward migration of such crabs in the spring. Most of the females die shortly after the last batch of eggs is laid. Crabs mature in about a year, growing in size by successive moltings. Mating occurs only at the last molt of the female, when the abdomen changes from the triangular to the apron form. The length of life is apparently two or three years.

An investigation of the spiny lobster, an important crustacean and excellent article of food in the waters of southern Florida, was undertaken about the middle of the fiscal year, and satisfactory progress is being made.

PROGRESS IN CULTURE OF DIAMOND-BACK TERRAPIN.

The results of the continued experiments in diamond-back terrapin culture at the Beaufort (N. C.) laboratory were given at some length in the last annual report. The progress during the past year has been gratifying, especially in the rapid growth of the young terrapin hatched in the summer of 1916. The largest individual kept in a warm house and fed during the winter was more than three inches (80 mm.) in length of bottom shell. This is believed to be a new record for the growth of diamond-back terrapin in the first year of life, and gives further encouragement to terrapin culture as a commercial enterprise.

STUDIES OF ANADROMOUS FISHES.

At the beginning of the fiscal year, two particularly important investigations were in progress relating to fishes which, though not alike in structure or appearance, have the same interesting and significant habit of leaving the ocean and ascending streams for the purpose of giving rise to a new generation. This habit is of particular practical importance because essentially all the mature individuals of the species are periodically assembled in definite runs in restricted localities, when they are easy of capture on the one hand and available for purposes of artificial propagation on the other. It is most desirable that there should be available specific and reasonably complete knowledge of the migrations of the shads and the salmons and of the conditions to be met in protective measures and in practices of artificial propagation.

Progress was made in the analyses of the data accumulated during the field studies on the principal shad streams from St. Johns River, Fla., to the St. Croix River, Me., and New Brunswick, but probably no stage of completion can be reported until, with a change of conditions, it becomes again possible to give the careful attention to the elaborate measurements, comparisons, and analyses which the subject requires.

A further investigation of the migrations of the Pacific salmon has been undertaken with the most competent assistance, having special reference to the salmon of Alaska and the problems of governmental and private artificial propagation.

INVESTIGATIONS PERTAINING TO FRESH-WATER FISHES.

The Bureau has continued actively the several investigations relating to the food of fresh-water fishes, both as independent studies and as phases of the experiments in the rearing of fishes in ponds. The results of more than two years of study of the habits and food of the yellow perch have been prepared for publication. A report on the pikes, comprising most of the known data regarding the habits, artificial propagation, and commercial importance of this well-defined family of fishes, has been issued and will prove useful to those who are interested in the cultivation of the pike, pickerel, and muskellunge, and to whom it is of importance to understand the relations of these predatory fishes with their less vigorous associates in natural or artificial bodies of water.

The serious decline in important fisheries of the Great Lakes, due to excessive and sometimes unrestricted fishing, long ago showed the necessity for a thorough knowledge of the habits and migrations of the principal fishes of the Lakes, in order that the regulation of the fishery and the artificial propagation of the fishes might be founded upon such a clear understanding of the habits and movements of the fishes that the maximum in practical results would be attained. It has not yet been possible to give to this field attention commensurate with the importance of the fisheries and the difficulties of the problems. A beginning was made during the fiscal year in the inauguration of a new study of the systematic relations, habits, and migrations of the fishes of the subfamily Coregoninæ, including the whitefishes and ciscoes or lake herring.

The experiments and investigations in the rearing of fishes in ponds, which have been pursued in connection with the fisheries biological station at Fairport, Iowa, have continued to yield gratifying results. While the artificial propagation of the buffalofish had previously been shown to be entirely feasible as regards the fertilization and subsequent handling of eggs and the rearing of young to a fairly advanced stage, the effort to have buffalofish spawn naturally in artificial ponds had not, until the spring of 1917, met with success. The conditions were varied last season by keeping the experimental pond about half full of water in the early part of the season and allowing it to fill gradually early in May. A few days after the pond was filled, a few buffalofish were observed to be "splashing" along the margin of the pond. Abundant buffalofish fry were observed soon afterwards, when specimens were collected and identified. Without additional experimentation it can not be definitely determined if the manner of manipulation of the pond practiced this season was the particular effective factor in bringing success.

In the last annual report it was mentioned that, in spite of many failures in earlier trials, a successful attempt at the propagation of the channel catfish, or spotted catfish, in ponds was in progress as the fiscal year closed. As the channel catfish at Fairport have again spawned under observation in the ponds of Fairport, it seems alto-

gether probable that this most highly esteemed of all catfishes can be propagated successfully in a practical way, by providing a suitable environment and proper nesting conditions, and by the exercise of care to separate the adults from the eggs or young at the proper time. The fry which hatched in the ponds and those which were hatched from eggs in jars in the experimental battery grew rapidly, attaining a length of 3 inches in a few weeks.

Other experiments in the propagation and rearing of the large-mouth bass and several species of sunfishes have also been in progress.

In experiments in the rearing of fishes attention has been given to the study of the food of the developing fishes at all stages, and to collateral observations of the available food supply. Experiments have also been undertaken in the artificial feeding of fishes in ponds.

During the fiscal year a careful biological and fish-cultural survey of certain waters of western North Carolina, including the Mount Pisgah National Forest Reserve, was made and information was gained that will be of material value in guiding the Government's activities in the propagation and protection of fishes in the reservation.

The fish capacity of artificial ponds or of natural lakes is determined by physical, chemical, and biological conditions, and success in the rearing of fishes or the conservation of fishes will be greater if guided by a proper knowledge of these interrelated conditions. The subject is one of much complexity and knowledge grows only by slow stages and patient application. The Bureau has been glad, therefore, to continue its cooperation with the State Geological and Natural History Survey of Wisconsin, in those fruitful studies of the biological and physical conditions in Wisconsin lakes which have a general application.

In the study of the fishes in relation to the extermination of mosquitoes and to public health, as supplemental to the broader investigations and activities of the Public Health Service and the Bureau of Entomology, a satisfactory degree of progress has been made and further experiments are undertaken in promoting a growth of desirable species of fish in impounded waters.

WATER-POWER DEVELOPMENT IN RELATION TO FISH LIFE.

With progress in water-power developments and a steady increase in the number of dams in the course of rivers frequented by migratory fishes, it is unfortunate that there is not more adequate information as to the conditions under which fishways are necessary and practicable and the types of fishways adapted for particular species of fish and conditions of stream and dam environment. As much attention as possible has been given to the matter during the fiscal year and a report on the subject was issued. Plans are in contemplation for more extended field studies during the fiscal year 1918.

The peculiar problems of fish protection in arid regions arise from the fact that large portions of the flow of streams may be diverted into irrigation canals, and, if the fish are permitted to pass freely through the canals and into the laterals, they must eventually be stranded in the fields or otherwise lost. An investigation of the conditions in irrigation projects was begun last winter, and a preliminary report on the subject has been made. The investigation has been interrupted for a time by the pressure of other matters.

At the Yuma (Ariz.) project the fish are excluded from the canals, because of an arrangement whereby the water enters the canals from a settling pool through a siphon that is fish tight. Seven miles below Yuma the maintenance of a dam on the Colorado River for diversion of water in Imperial Valley, Cal., causes the river bed below the dam to be left dry at times so that quantities of fish are stranded. The Salt River project involves a large system, but as the canals and ditches always contain water there is little reason to suppose that much damage to fish occurs. The reservoir formed by the construction of the Roosevelt Dam in Arizona has been well stocked with bass. Fish are reported to be lost in the spring freshets, when the water rises to a height of 10 feet or more above the top of the spillways, carrying fish over the dam and through a fall of 225 feet. The prevention of such losses by the use of screens to hold the fish back has been given consideration, but the difficulties are very great and possibly insurmountable.

In California, and especially in the Sacramento River basin, where large areas of land are farmed by irrigation, large losses of fish would occur but for the effective work of the State authorities in requiring all ditches and intakes to be provided with screens and all dams with fishways. A recent act of the legislature requires the owners of dams that are too high for a useful fish ladder to build and maintain hatcheries. In that State the "squirrel-cage" type of revolving screen is generally recommended for its simple design and cheapness of construction, but for canals wider than 25 or 30 feet the parallel-bar type of screen is considered the only practical means of keeping fish out. In Nevada a new law effective September, 1917, requires the screening of intakes and ditches as well as the use of fishways. Irrigation is extensively practiced in the northern half of the State, and heretofore countless numbers of trout fry and other fishes have been poured into the fields.

SERVICE OF THE BIOLOGICAL LABORATORIES.

The various investigations in progress at the several biological laboratories at the close of the preceding fiscal year were continued during the early part of the present year. Before the close of the year, however, it was found desirable to adopt temporarily a new policy with regard to the laboratories because of the necessity of concentrating all efforts, as far as possible, upon the immediate increase of the aquatic food supply.

The laboratory at Woods Hole was not opened for general investigations but a special staff was stationed at that laboratory for work relating to the improvement of methods of preserving fish. One investigator was employed for observation of the occurrence of nematode parasites in the flesh of marine fishes, a question which has been found to have a direct bearing upon the marketing of fish.

At the Beaufort laboratory the scientific staff consisted only of the director and one investigator who was enabled to continue the important and timely investigation of the protection of wood against marine borers. The director devoted himself to experiments in the curing of fish by methods of salting and of salting and smoking. It had been generally believed that the curing of local fishes during the summer was not practicable, but, largely as a result of the Bureau's

efforts and experiments, several kinds of fishes have been preserved and the dealers have found a good demand for salted fish.

The fish-cultural experiment work of the fisheries biological station at Fairport bears so directly upon the immediate problems of food supply that the activities of this station have suffered no curtailment, but are expected to be somewhat extended during the ensuing year. Among the investigations in progress, apart from the direct experiments in rearing fishes as previously referred to, are those relating to insects and insect larvæ, aquatic plants, and parasites, as they affect the productivity of ponds or lakes. The results so far obtained are already valuable in guiding the management of fishponds.

The construction of the marine biological station at Key West was undertaken during the fiscal year. The pool which will serve as a source of supply for sea water, for the protection of small boats, and for other purposes, has been excavated, and a canal connecting the pool with the ocean has been completed except for a control gate. Plans for two of the buildings were completed and bids were advertised for in the last month of the year. Owing to various causes, including the present high prices of labor and materials, there exists some doubt if a reasonable bid will be received. Meantime, some scientific work was begun during the winter and encouraging progress has been made. The study of the spiny lobster has been the principal investigation.

MISCELLANEOUS INVESTIGATIONS AND SERVICES.

There has been an unusual number of calls upon the Bureau for investigations and advice relating to the diseases of fishes or to the mortality of fishes in public or private waters, due either to disease or to industrial pollutions. In as many cases as possible the fish pathologist of the Bureau, or an assistant, has visited the scene of trouble, made all practicable observations or collections, and upon return to the office has subjected the material and data to careful examination. The most serious trouble of this kind to arise was a mortality of sea fishes on the west coast of Florida, which has been described and discussed in a published report.[a] Other serious, troubles manifested themselves in Chesapeake Bay, Saginaw River and Bay, and elsewhere.

The Bureau has not only continued to cooperate with the Bureau of Soils, as far as the conditions permitted, in a study of kelp harvesting in relation to the fisheries, but it has begun a systematic study of the distribution of marine algæ on the west coast with particular attention to species that may be useful in the industries.

ALASKA FISHERIES SERVICE.

IMPORTANCE OF THE ALASKA FISHERIES.

All branches of the fishing industry, except whaling and halibut fishing, showed an increase in 1916 over 1915, and the fisheries in the aggregate were more extensive and valuable than ever before. The number

[a] Mortality of Fishes on the West Coast of Florida. Appendix III, Report of Commissioner, 1917; by H. F. Taylor. Bureau of Fisheries document No. 848.

of persons engaged was 23,994, an increase of 1,532 over the previous year; the investment amounted to $39,569,612, an increase of more than $2,253,000; and the value of the products was $26,156,559, an increase of more than $5,157,000. The yield of the fisheries in both quantity and value was the largest in the history of Alaska. The record year, 1914, was surpassed by nearly $5,000,000 in the market value of the output.

The salmon industry in 1916 represented 88 per cent of the total investment in Alaska fisheries and 92 per cent of the total value of products. An important feature of the business was the operation of 100 canneries, a gain of 15 over 1915. The pack of canned fish reached the stupendous total of 4,900,627 cases, valued at $23,269,429, which figures were never before equaled. In southeast Alaska, the runs of coho and chum salmons were the largest ever known, and the runs of humpback and red salmons were exceeded only by the seasons of 1915 and 1914, respectively. In central Alaska there were exceedingly heavy runs of humpbacks and reds, and the fish canned exceeded by 400,000 cases the high record of 1914. In western Alaska, the district in which the red salmon predominates, the catch of 19,600,000 fish was but little less than the average for the five-year period ending with 1916 and was about 3,000,000 fish more than in 1915.

The other important Alaska fisheries in 1916 had the following value of products: Halibut $679,463, cod $518,797, herring $418,076. and whale $363,721. As compared with 1915, the halibut and whale fisheries showed a decline and the cod and herring fisheries an advance,

VIOLATIONS OF THE FISHERY LAWS.

Taking into consideration the immense extent of the fisheries, the vast territory covered by the operations, the comparatively unsettled condition of most of the coastal sections, and the strong temptations that come to the fishermen to take fish regardless of the welfare of the industry, serious violations of the fishery laws are remarkably infrequent.

During the 1916 fishing season a number of cases of minor infraction of the laws were reported by the Bureau's agents to the local United States commissioners and district attorneys. These cases involved fishing during the weekly close period, fishing in prohibited areas, and using nets within illegal distance of other nets. In most instances conviction was secured and a fine was imposed. A noteworthy batch of cases was brought before the United States commissioner at Haines in August, 1916. The Bureau's warden made complaint against the operators of 3 boats and 28 operators of nets, found fishing in Chilkoot River and Chilkoot Lake in violation of the weekly close-time provision of law. All of the defendants pleaded guilty and were fined from $1 to $250 and costs.

CENSUS OF WOOD RIVER SALMON.

Wood River, a tributary of Nushagak Bay, has for many years been set aside as a natural breeding preserve for salmon, chiefly resorted to by the red salmon. In order to keep informed as to the extent to which the salmon are able to escape the commercial fishing operations in Nushagak Bay and pass up Wood River to their spawn-

ing grounds about Lake Aleknagik the Bureau in 1908 began the enumeration of the fish and has continued this work each year since, 1914 excepted. By means of a temporary rack thrown across the stream near the lake, the fish are compelled to pass through a narrow gate and are there counted by agents kept continuously on duty, by day and night, for about seven weeks during which time the run lasts.

In 1916, between June 23 and August 12, the number of salmon ascertained to have gone to their spawning grounds was 551,959, compared with 259,341 in 1915. The bulk of the fish came in three distinct waves in July, at the crest of which 57,237, 47,343, and 55,864 salmons, respectively, were noted in 24 hours. Except during the heavy runs a considerable proportion of the fish showed injuries attributable to nets, and such fish were somewhat more numerous than in 1915.

Acknowledgments are due to several fishing companies for assistance which made this work possible. The Alaska-Portland Packers' Association provided a tug for towing the equipment to the lake. The Alaska Salmon Co. supplied a boat for use in making investigations on the lake and the Alaska Packers Association furnished the entire equipment required for making the count.

A FISHERY INTELLIGENCE SERVICE FOR ALASKA.

In response to a formal request by the Territorial Legislature of Alaska, the Bureau of Fisheries in conjunction with the Signal Corps of the United States Army established (in the summer of 1917) a fishery intelligence service whereby a number of coastal towns in Alaska are furnished daily (Sundays and holidays excepted) with the prices of fishery products at Seattle and Ketchikan. The daily quotations include the prices of the more important kinds of fresh fish, and on Monday of each week additional information is furnished in regard to prices of salt products at Seattle and Ketchikan. It is hoped that the service thus afforded the public will tend to stabilize prices and to create a more dependable market for the fishermen's products.

COMMERCIAL FISHING WITHIN THE ALEUTIAN ISLANDS RESERVATION.

During the past fiscal year 11 permits to engage in fishery operations within the Aleutian Islands Reservation were issued to the following persons and companies:

1. S. Applegate, of Berkeley, Cal., authorizing the packing of not to exceed 300 barrels of salmon per annum in the vicinity of Umnak Island.
2. A. C. Goss, of Unalaska, authorizing the taking of atka mackerel and red salmon in the vicinity of Attu Island and Umnak Island, respectively, in 1917.
3. Pacific American Fisheries, authorizing the construction and operation of a plant on Ikatan Peninsula for the canning or salting of salmon or other food fishes.
4. Sockeye Salmon Co., authorizing the construction and operation of a plant on Unimak Island for the canning or salting of salmon or other food fishes.

5. Paul Buckley, of Unalaska, authorizing him to engage in cod fishing operations on Akutan Island.

6. Paul Buckley, authorizing him to engage in cod fishing operations on Unalaska Island.

7. Alaska Fishing Co., authorizing the taking of not to exceed 1,000 barrels of salmon in the vicinity of Unalaska Island in 1917.

8. Paul Buckley, authorizing him to construct and operate on Unalaska Island a plant for the canning or salting of salmon and other food fishes taken in the vicinity of Unalaska Island.

9. O. K. Quean, of Unalaska, authorizing him to take not to exceed 200 barrels of salmon in the vicinity of Unalaska Island in 1917.

10. Alaska Commercial Co., authorizing the packing at Unalaska of not to exceed 50 barrels of salmon in 1917.

11. Andrew C. Smith, of Portland, Oreg., authorizing him to engage in the business of salting cod and salmon for commercial purposes at Chernofski Harbor and Kuliliak Bay.

All of these permits stipulate that employment shall be given as far as practicable to natives of the reservation in the matter of carrying on the operations authorized. All permits are revocable at the pleasure of the Secretary of Commerce.

Two permits authorizing operations within the Aleutian Islands Reservation have been issued jointly by the Departments of Commerce and of Agriculture. One involves the pasturing of cattle, sheep, and other domestic animals by Paul Buckley upon that part of Unalaska Island which is south and west of Kashega and Kuliliak Bays; the other somewhat similar operations on Unimak Island by Andrew C. Smith.

INSPECTION OF PRIVATE HATCHERIES.

In the year 1916–17 there were operated in Alaska four salmon hatcheries belonging to companies engaged in the catching and canning of salmon. These obtained 90,136,000 eggs of the red salmon, and hatched therefrom 83,353,000 fry which were planted in local waters. Under the law the rebates of taxes allowed these companies, amounting to 40 cents for each 1,000 red or king salmon fry released, aggregated $33,341.

STREAM IMPROVEMENT.

An important matter in the conservation and increase of the salmon supply in Alaska is the improvement and development of additional natural spawning beds. There are numbers of streams in Alaska, particularly in the southeastern section, which are impassable to salmon because of natural barriers, chiefly waterfalls. In some cases, also, streams have become choked through the accumulation of timber and other débris. It is felt that much good may be accomplished by giving the salmon every possible opportunity to spawn naturally. There are various places where falls can be blasted out or where fishways can be established, thus opening up a considerable extent of spawning area which heretofore has been wholly inaccessible to salmon or which in some instances has been accessible only at periods of high water. The Bureau feels that at comparatively small expense excellent work can be done in bettering

these conditions. A few streams were improved in this way during the past year, but the work has been limited because of a lack of funds. It is hoped that these operations can be undertaken on a more extensive scale in the near future.

ALASKA FUR-SEAL SERVICE.

SEAL ISLAND NATIVES.

The welfare of the native inhabitants of the Pribilof Islands is a matter demanding and receiving the constant solicitude of the Bureau. The attitude of Congress toward these people, as shown by the safeguards thrown around them and funds provided for them, has resulted in the gradual development of a community that is probably better cared for than any other natives of Alaska.

On June 30, 1916, the resident natives numbered 311 (192 on St. Paul and 119 on St. George Island), and on March 31, 1917, they numbered 316 (193 on St. Paul and 123 on St. George). The population remains nearly stationary, the fluctuations in recent years not exceeding 2 or 3 per cent. The general health of the natives has continued good. The physicians and the school-teachers, acting under the immediate direction of the agents, deserve much credit for their work in improving sanitary conditions among the natives and for their efforts to raise the standard of living.

A full account of the measures taken for the support of the natives, their education, and their physical care is given in the report on the Alaska service for the calendar year 1916.

The act making appropriations for the Bureau for the fiscal year 1917 contained an item of $20,000 for new buildings, repairs to old buildings, and other necessary improvements on the Pribilof Islands. The appropriation became available too late to permit the purchase and transportation of materials in the season of 1916. Accordingly, the work of planning for the most important constructions and repairs was taken up in the winter of 1916–17, and a large quantity of building material was sent to the islands in July, 1917, on the steamer *Roosevelt*. The matters to which special attention has been given during the present season, in addition to general repairs to existing structures, are (1) the construction of new houses for natives on both islands, (2) the construction of a new salt house on each island for use in preserving and storing sealskins, (3) the installation of a new water-supply system for the village on St. George Island, (4) a survey for a new water-supply system for the village on St. Paul Island, and (5) important sanitary improvements on St. Paul Island.

Careful consideration has been given to the type of house that would be most suitable for natives. The houses now occupied were built for the most part 40 years ago, and are small, uncomfortable, and insanitary. Final choice has been made of a neat, simple knock-down house, plans for which were submitted by a Seattle firm, comprising a living room, three bedrooms with closets, a kitchen, and a bathroom, all on one floor. Four such houses for St. Paul Island and two for St. George Island have thus far been provided.

The large quantities of supplies annually required for the support and use of the natives, and of the Government employees on the

islands, together with the materials needed in connection with the taking, curing, storing, and shipping of seal and fox skins, were, for the season of 1917, sent to the islands on the steamer *Roosevelt*. This is the first time that the Bureau has been able to employ its own vessel for this service.

APPROPRIATIONS FOR SEAL SERVICE.

Owing to the increased cost of supplies it became necessary to devote a larger part than heretofore of the appropriation of $75,000 for the fiscal year 1917 to the Pribilof Islands. During the second half of the fiscal year the Bureau was forced to limit greatly or altogether suspend certain activities of the work pertaining to the protection of the fisheries and the minor fur-bearing animals. Congress has made the same appropriation, namely, $75,000, for the entire Alaska service for the fiscal year 1918. In the season of 1917 there was a still further increase in the cost of supplies, as was evidenced by the return of proposals submitted in May, when the aggregate amount was found to be approximately $72,000. Steps were, therefore, taken to secure a supplementary appropriation. Inasmuch as the Bureau is charged with the support of the natives on the Pribilof Islands, it feels that its first duty is to purchase the needed supplies for that purpose. Unless Congress meets this emergency, the work of the Alaska service in regard to the protection of the fur-bearing animals and fisheries must perforce be so curtailed and limited as to be seriously ineffective.[a]

CONDITION OF THE SEAL HERD.

A detailed statement of the condition of the Alaskan seal herd in 1916, with various tables and comparisons with former years, is contained in the report entitled, "Alaska Fisheries and Fur Industries in 1916," published in August, 1917 (Bureau of Fisheries document No. 838, 118 pages). The usual complete census, conducted by G. Dallas Hanna of the Bureau's staff, showed 417,281 seals of all ages in the herd in the summer of 1916, an increase of 14.6 per cent over 1915. Tentative figures of the census of 1917, also under the direction of Mr. Hanna, indicated a total of 468,692 animals of all ages. The estimated number of pups born in the summer of 1917 was 128,024, as against 116,977 in 1916.

These increases in the seal herd resorting to the Pribilof Islands are regarded as entirely satisfactory and such as are to be regularly depended on so long as the present conditions prevail. The recuperation of the herd to something like its former proportions within a comparatively few years may confidently be expected. The natural mortality among the various classes is now normal; and the only untoward feature of the present situation is that arising from the great preponderance of mature and adolescent male seals as a result of the close-time that has been effective for five years and expired on August 24, 1917. It should be the consistent policy of the Bureau, as it is its obvious duty, in the light of the established biological facts and economic demands, to so administer the seal herd as to overcome the existing disparity of male life and to ultimately bring the herd to a condition approaching that of a scientifically managed herd

[a] Congress has since appropriated an additional sum of $35,000 for the Alaska service for the fiscal year 1918.

of dairy cattle, where every young female born will be saved and reared and every young male not actually required for breeding purposes will be otherwise utilized in the most profitable manner.

SEALS REQUIRED BY SEAL ISLAND NATIVES.

The quota of seals whose meat was needed for food by the natives of the Pribilof Islands was tentatively fixed at 7,500 for the calendar year 1916. The number actually taken and utilized, including the few seals which died during the drives, was 6,468, of which 3,483 were from St. Paul Island and 2,985 from St. George Island.

For the calendar year 1917, which up to and including August 24 was subject to the close-time law fixed by Congress, the food requirements of the natives were regarded as the same as in 1916, although it was of course contemplated that a part of those requirements would be met by the seals taken for commercial purposes.

SALE OF SEALSKINS.

During the fiscal year 1917 there were three public-auction sales of skins taken from the seals that had been killed for the use of the natives. These sales were conducted at St. Louis by Messrs. Funsten Bros. & Co., agents of the Department, and consisted of skins that had been received during several years, there having been no attempt to dispose of sealskins in the fiscal year 1916 owing to the condition of the market. The details of the sales are as follows:

Date.	Skins.	Gross prices received.	Net prices received.	Average gross price per skin.
	Number.			
September 20, 1916	1,900	$74,530.00	$52,083.26	$39.23
January 29, 1917	2,000	93,678.00	65,450.27	46.84
April 18, 1917	1,500	68,540.50	48,259.65	45.69
Total	5,400	236,748.50	165,793.18	43.84

All of the foregoing skins were dressed, dyed, and machined before being offered for sale, and were thus ready to be made into garments. This is the newest feature of the sealskin industry as established in America by the Department. The financial results have been such as to fully justify the agreement whereby the Government paid $10 apiece for the skins thus treated, and the buyers have expressed great satisfaction that they were able to obtain finished goods, whereas under the conditions formerly prevailing they would have been obliged to undergo the delay, the uncertainty, and the greatly increased expense of having their raw skins shipped to London and reshipped to America before any use could be made of them. It is impossible to state just what monetary benefit the Government has derived from this arrangement, but some data afforded by the April sale were very suggestive. On that occasion there were sold at public auction, under the same conditions that attended the sale of 1,500 dyed and dressed Alaskan skins, 1,553 raw skins taken from the Robben Island seals under the supervision of the Japanese

Government; the Japanese skins were of essentially the same quality as the Alaskan, and whereas the former brought on an average $25.84 per skin, the latter, as already stated, brought $45.69 per skin, an increase of $19.85 after allowing for the cost of preparation.

All branches of the fur-seal industry have thus become firmly established in America through the action of the Department, and not only Alaskan skins but skins from seal herds in the custody of other governments are finding their markets here.

BRANDED SEALS.

The 5,228 fur-seal pups branded on the Pribilof Islands in 1912 have continued to afford valuable data bearing on the relation of age to size and growth. These data supply the most authentic and only conclusive evidence on this much-discussed subject.

During the season of 1916 numbers of these branded seals—both male and female—were observed in drives and on the rookeries. On St. George Island, in the period from June 9 to August 10, 1916, there were noted in various drives 198 male seals bearing the 1912 brand and therefore 4 years old; 30 of these were taken for accurate measurement. Branded seals were noted in nearly every drive of bachelors and in considerable numbers among the cows in the harems. On St. Paul Island 44 branded males were taken for examination. The foregoing examples were included in the 1916 shipment of skins and were classified by the experts in St. Louis as follows, the designation being in accordance with the long-established and universally recognized London standard:

	Number.
Small pup	2
Middling pup	4
Large pup	22
Small	27
Middling	4
Middling and small	15
Total	74

The variations in the size of seals of the same age are clearly shown in this statement. The 74 skins from seals known to be 4 years old fall into six trade categories, with "large pups" and "small" predominating. The trade names applied to sealskins have come to mean so little and are so misleading that a new classification would seem to be demanded.

UTILIZATION OF WASTE PRODUCTS OF THE SEALING INDUSTRY.

With the exception of limited quantities of seal meat required by the native inhabitants of the Pribilof Islands, practically the entire carcass of the fur seal after the removal of the skin has up to this time been discarded. During the close time, with its restricted take of seals, this waste of useful material has not been serious, but with the resumption of commercial sealing it will become the duty of the Bureau to endeavor to find a practicable way of utilizing the seal carcasses and of thus making the fur-seal service still more of a revenue producer to the Government. The difficulties connected

with the profitable exploitation of this waste material are the cost of transportation, the absence of harbors, and the uncertainty attending the landing and loading of equipment and products. To this matter, to which considerable attention has already been given, the Bureau will devote still further effort looking to the conduct of the work either by private firms under contract or by governmental agency.

A valuable legacy of the old times, when 5,000,000 pounds of seal carcasses were frequently allowed to rot on the killing grounds in a single year, is the accumulation of bones. No use was ever made of this important fertilizer, and it has remained for the past year to record the first attempt to secure the commercial utilization of seal bones.

The Bureau has conducted considerable preliminary work to determine the extent and value of the seal-bone accumulations, and has interested numerous individuals and firms in the matter. In the summer of 1916 a considerable quantity of bones was collected and sent down on the supply ship; and samples of this shipment in lots of 50 to 300 pounds were, on request, sent to various persons for examination. An analysis made by the Bureau of Soils, Department of Agriculture, showed that these bones, some of the samples of which were from seals killed many years ago, have valuable fertilizing properties, containing from 24.85 to 25.26 per cent of phosphoric acid and from 4.57 to 4.80 per cent of nitrogen. A report received from the islands indicated that the bone deposits actually in sight represent about 6,000 tons, with a number of killing grounds not included; and it has become apparent that, notwithstanding the skepticism and scoffing of certain persons who had formerly been on the islands, there exists in these bones a valuable resource which should be put on the market, especially at this time when the supply of fertilizers has been reduced by the war.

Some of the bones, resulting from the most recent killings, are on the surface, but most of them have become overgrown with grass and are covered with earth and sand. During the past year the natives have been employed, at such time as their other labors would permit, in collecting bones. Owing to the frozen state of the ground, the work of gathering bones is mostly confined to the period from May to November. This coincides with the active sealing season when every able-bodied native must devote considerable time, and some of them all the time, to sealing operations, the landing of supplies, the shipment of skins, and occasionally to important construction work. For these reasons the quantity of bones that would otherwise have been available in the season of 1917 was curtailed, but nevertheless several hundred tons were gotten ready and will be shipped as opportunity is offered. The poor roads on the islands hinder the transportation of bones from the deposits to the villages, but the situation is being improved, and a light motor-truck equipment is being provided to facilitate this work. Bone crushers have been sent to the islands so that bones may be ground and thus be put in compact form to save space in transportation.

After considerable correspondence and negotiation with various persons and companies in regard to the utilization of the bone deposits on the Pribilof Islands, the Bureau early in July, 1917, accepted an offer made by a Seattle firm to pay $30 per ton for 300 tons or less

delivered f. o. b. vessel at dock in Seattle. A similar offer may be expected for all the bones that may be obtainable in the next few years.

Arrangements are being made so that all other by-products resulting from the taking of fur-seal skins will be utilized. It is expected that use can be made of all seal gullets, which have been found to be convertible into a good grade of light leather suitable for special purposes. Experiments are now under way to use the intestines for casings. The blubber is being saved for use in dressing the skins. A small canning outfit was sent to the islands in the summer of 1917 with a view to determining the feasibility of canning seal meat, of which a quantity far in excess of the natives' needs will hereafter be available. A considerable quantity of the waste products resulting from sealing operations will be required for feeding the fox herd on St. George Island, where the supply of natural food during the winter is very limited.

Careful consideration is now being given the plan of installing a small plant at the Pribilof Islands for the purpose of preparing oil and fertilizer or other products from the excess refuse material resulting from the seal killings. This matter will be definitely worked out before another season, so that there will be no loss of any part of the seal products. This is a distinct advance over conditions which existed at the Pribilof Islands when commercial killing was in progress years ago, for at that time there was no effort to make use of any part of the seal except its pelt.

In anticipation of large sealing operations and the necessity of employing the best methods in taking, curing, and caring for the skins of fur seals, and also of blue foxes, an arrangement was made with Messrs. Funsten Bros. & Co. whereby there were sent to the islands in the season of 1917 two experienced seal men from Newfoundland and two expert sealskin handlers from St. Louis. These men are to cooperate with the agents, instruct the natives, and bring into closer relation than heretofore the seal fishery and the sealskin trade.

BLUE FOXES AND REINDEER ON THE PRIBILOF ISLANDS.

In September, 1916, the skins of blue and white foxes that had been taken on the Pribilof Islands in the preceding winter were sold at public auction in St. Louis. The extraordinary prices received for blue-fox skins in the 1915 sale were not obtained in 1916. The best lots brought $113, $125, $128, and $135 per skin, the average for the entire collection of 420 being $48.20. The 20 white-fox skins brought $14.25 each. The gross receipts from this sale were $20,527.

During the winter of 1916–17 the foxes on St. George Island were found to be unusually numerous, and there was a noteworthy increase in the number of pelts obtained. The take of 417 blue-fox skins and 2 white-fox skins left an ample reserve, 413 foxes having been marked and released, while many unmarked animals were known to be on the island at the end of the trapping season. The pelts obtained on St. Paul Island numbered 150 blues and 37 whites. These skins, numbering 606, were sent to Seattle on the steamer *Roosevelt* in August, 1917.

In compliance with a request from the Bureau of Biological Survey, Department of Agriculture, there were furnished from the Pribilof Islands six pairs of blue foxes for an experimental fox farm located in New York. The foxes were captured on St. George Island, taken to Seattle on the supply steamer, and delivered to an agent of the Department of Agriculture; two of the animals died en route.

From the small number of reindeer placed on the seal islands in 1911, there has grown a herd which in August, 1916, numbered about 196 animals of all ages. A few of the males have been appropriated for the food purposes of the natives, and plans have been made for increasing the usefulness of the reindeer to the natives.

VESSEL FOR THE PRIBILOF ISLANDS.

St. Paul and St. George Islands, which are the two important islands of the Pribilof group, are approximately 40 miles apart. At present there is no safe means of getting from one island to the other except upon the infrequent occasions when a Coast Guard cutter happens to be in the vicinity or the Bureau's supply steamer *Roosevelt* is making a regular trip. These islands are practically in the center of Bering Sea and are exposed to heavy storms, hence the small launches now in use are altogether unsuited and unsafe for this journey between the islands. It is therefore felt that a stanch vessel at least 75 feet in length and about 18 feet in breadth, and powered with an internal-combustion engine of at least 125 horsepower, should be secured for use at the islands. This vessel should be of the type which has been developed as the most satisfactory form of cannery tender for use in the exposed waters of Alaska, capable of riding out a gale when necessary.

A tender of this character for the islands is very much needed for the transportation of persons, especially at the time when the important work of the fur-seal census is in progress, and it is also needed for the transportation of supplies from one island to the other. It is required for occasional trips to Unalaska, the nearest town, 250 miles distant. With the resumption of commercial sealing operations next season, such a vessel will be very valuable in handling the increased take of fur-seal skins and other products, particularly in the matter of lightering cargo to the ship, which must anchor some distance offshore. A tender of this type may also be very important for use at times as an auxiliary in guarding the fur-seal herds.

It is therefore recommended that Congress be asked to authorize the construction or purchase of a vessel of this character for the purposes stated, and an item to this end has been inserted in the estimates of appropriations for 1919.

SEALSKINS TAKEN BY ABORIGINES.

Under certain restrictions Indians, Aleuts, and other aborigines dwelling on the Pacific coast of North America north of the thirtieth parallel of north latitude may hunt fur seals. Primitive methods of capturing seals are enjoined by law and treaty and the

annual take of skins by the aborigines residing in the United States is quite small. From communications which the Bureau receives from time to time, it is evident that some fur-seal skins are being taken by Indians in British Columbia. No information is at hand to indicate that any considerable number of seals were taken by Alaskan natives in the calendar year 1917. A few skins are known to have been taken in the vicinity of Sitka, Alaska, by Indians in the spring of 1917, the seals having been speared, and it is reported that the natives still have these skins and understand that they must be authenticated if they are to become items of trade. In May and June, 1917, certain Indians of the State of Washington engaged in fur-seal hunting. The Bureau again secured, through the Department of the Interior, the cooperation of Dr. C. L. Woods, superintendent and physician in the United States Indian Service at Neah Bay, Wash., in the matter of authenticating the skins. To date (Aug. 17) the Bureau has received from Dr. Woods certificates in regard to 513 of these skins. These certificates indicate that all were speared from canoes and that 211 were taken from male seals and 302 from females.

MINOR FUR-BEARING ANIMALS OF ALASKA.

WORK OF THE WARDENS.

The force of wardens was active in the season of 1916–17, and was located as advantageously as possible with reference to the trapping operations. The shortage of funds for this service, occasioned by the greatly increased cost of supplies for the Pribilof Islands, restricted the movements of the wardens and impaired the efficiency of the service.

There have been several complaints and prosecutions for violations of the fur-bearing-animal laws and regulations of Alaska. Notwithstanding that strong evidence was submitted in the cases taken to court, no convictions resulted. The general sentiment, particularly in the sparsely populated and remote districts, is such that convictions for violations of the fur-bearing-animal laws and regulations are secured only with the greatest difficulty. In addition, a number of investigations have been made of complaints of alleged poisoning and illegal trapping.

REGULATIONS.

No new regulations governing the taking of fur-bearing animals were issued during the season 1916–17.

In connection with the total prohibition of the killing of martens for a period of five years from March 15, 1916, it has developed that certain trappers wished to retain possession of skins legally taken; and in order that no injustice might be done the owners of such skins, when they desired to ship them, arrangements were made for recording all these pelts that it was proposed to hold in Alaska after November 15, 1916. All shipments of marten skins from Alaska after that date will be checked against the records thus obtained. The Bureau has received 58 such reports, covering 3,031 pelts.

For some years the Post Office Department has aided the Department of Commerce in obtaining statistics of the furs shipped from Alaska by mail. An order of the Postmaster General dated May 4, 1917, published in the Postal Guide for June, reaffirmed the policy of cooperation and made certain changes in instructions to postmasters which will undoubtedly result in an improved service. The new order became effective October 1, 1917.

FURS SHIPPED FROM ALASKA.

Statistics compiled by the Bureau indicate that during the period from November 16, 1915, to November 15, 1916, the value of the furs shipped from Alaska was $911,244, exclusive of the fur-seal and fox skins from the Pribilof Islands, as against $400,532 in the preceding similar period. The leading fur bearers of the Territory are foxes, lynxes, minks, muskrats, and land otters. In 1916 there was a noteworthy increase in the number and value of most of the important pelts shipped to market. The number of lynx pelts was 21,608 against 9,374 in 1915, and the average price advanced from $8 to $12. The number of red-fox skins increased from 11,770 to 15,711, and the average price increased from $8 to $12. Over 101,000 muskrat skins came out in 1916 against less than 33,000 in the previous year. The shipment of mink skins fell off slightly but the average value advanced 100 per cent.

FUR FARMING IN ALASKA.

Although Alaska is well known as a producer of furs, it is not believed that its possibilities for fur farming, particularly the breeding of foxes, have been generally appreciated or recognized. There are various sections where it has been demonstrated that such operations may be conducted successfully. For several years past there have been a number of fur farms in operation on the Tanana and Yukon Rivers. The Copper River district is another section where fur farming has been prosecuted with a considerable measure of success. Still another region which has proved suitable is the Chilkat Valley in southeastern Alaska. Fur farming has also been conducted for many years on islands, particularly in the Afognak-Kodiak region, and islands to the westward, including the Shumagin Group.

In southeastern Alaska a number of islands have been devoted to fur farming, but except in one or two instances operations have not been successful. As in the case of other islands elsewhere in Alaska, this appears to have been due to the impression that it was only necessary to release a few pairs of foxes upon an island and in due time reap an easy harvest of pelts. In some cases even this indifferent method was moderately successful, but real success in the propagation of foxes on islands in Alaska has occurred only where intelligent supervision has been given. There has been a notable improvement along this line in recent years. It is now the custom on some of the islands and in all cases of fur farms on the mainland to construct carefully designed wire inclosures, or corrals, where the animals are subject to that attention which experience has demonstrated to be essential to success. There appears to be no reason why Alaska

should not assume a much more important rôle than heretofore in the business of fur farming.

At the end of the fiscal year 1917 four islands were under lease by the Department for the propagation of fur-bearing animals. These were Middleton, Simeonof, Little Koniuji, and Marmot Islands. The lease of Carlson Island was canceled November 22, 1916, and Marmot Island was leased for five years, beginning September 1, 1916, at $200 per year. Negotiations have been pending for the lease of Pearl Island.

MISCELLANEOUS MATTERS.

SPECIAL CONSTRUCTIONS AND IMPROVEMENTS.

No new hatcheries or laboratories were authorized during the fiscal year but a number of special appropriations became available for improvements at several stations, and construction work was also in progress at various stations under former appropriations.

At Key West, Fla., the site of the marine biological laboratory authorized some years ago, a salt-water reservoir, 40 by 45 feet, has been excavated together with a canal 210 feet long connecting the reservoir with the open bay. The canal is to be provided with gates, and an ample supply of pure sea water is assured. Part of the foundation for the laboratory has been constructed, and plans and specifications for a residence building and pump house with provisional laboratory have been prepared and bids for their construction have been solicited. An additional appropriation of $25,000 has been made, but it is evident that, under existing conditions, the amount provided is inadequate for the completion of an acceptable laboratory.

At the Louisville (Ky.) station, the construction work has included six concrete rearing ponds 8 by 20 feet, an earth pond 79 feet square for growing aquatic plants and minute animal food for young fish, and supply and drainage pipes. With the exception of a fence, this station is regarded as complete.

At the Springville (Utah) station, a hatchery and a superintendent's dwelling have been built. The hatchery, 34 by 97 feet, contains 120 troughs, with ample office, storage, and other rooms. The dwelling is a frame structure with 8 rooms and modern conveniences.

The old wooden flume for supplying water to the Duluth (Minn.) hatchery has been replaced by an iron pipe line.

Bids within the limits of the several appropriations for a retaining basin for brood fish at the Gloucester (Mass.) hatchery, for a lobster-rearing plant for New England, and for two new steel fish-distribution cars have not as yet been obtained.

The title to the property on Block Island, R. I., selected for a fish-cultural station as authorized by the act of Congress approved June 23, 1913, was found, on investigation, to be somewhat involved, and it was necessary, in accordance with the State law, to obtain from the probate court of the town of New Shoreham permission to sell the property. This was granted by decree of the court on October 2, 1916. The Legislature of the State of Rhode Island, in 1909, ceded to the town of New Shoreham all control over the waters within 1 mile of the shore of Block Island and granted the electors of that town authority to enact ordinances to protect and regulate

the taking of fish in Great Salt Pond. The act of the State legislature granting certain privileges to the United States Commissioner of Fisheries, approved by the governor of Rhode Island on May 11, 1914, therefore does not apply to the waters adjacent to the property selected on Block Island. In order to cover this privilege, the town council of the town of New Shoreham on June 20, 1917, passed the following resolution:

Resolved, That the United States Commissioner of Fisheries and his agents be and they are hereby granted unrestricted right to fish in the waters adjacent to Block Island and the right to conduct fish-cultural operations in any manner, at any time that may by them be considered necessary and proper, together with the right to fence in the small cove [adjoining the property selected] and the exclusive right to the use of this cove.

The Government, however, has not been able to accept the deed to the property as the State of Rhode Island has no law which cedes jurisdiction to the United States over the land which the Government may acquire for fish-cultural purposes. The governor of the State has been requested to assist in procuring the passage of such an act by the legislature during the next session, which meets in January, 1918.

At the Clackamas (Oreg.) station a new salmon hatchery was constructed with an appropriation that was made available in 1914. The structure is 58 by 100 feet. Its lighting is rendered almost perfect from white inside finish and 43 prism-glass windows. Other new buildings provided at this place were a combination carpenter shop and woodshed, 20 by 40 feet, a garage and lumber storage combination 22 by 30 feet, a pump house 12 by 18 feet, and a paint house 9 by 15 feet. All new buildings are on concrete foundations and so constructed that decaying floors can not affect the walls or other parts. The station is practically new and highly attractive in appearance. A new water system was installed with two electrically driven pumps, which are separate units. Their combined delivery is 1,600 gallons per minute, the discharge being into an excavated reservoir of 210,000 gallons capacity.

Taking advantage of the lull in fish-cultural operations at the Michigan stations during the first three months of the fiscal year, important repairs and improvements were made to the water supply and pond system at Northville, a special appropriation for the purpose having been obtained. The work included the grading and enlargement of the spawning space in two of the bass ponds, replacing 487 linear feet of old vitrified sewer crock connecting the dam and the water-supply reservoir with 16-inch iron pipe, and repairs to the retaining wall protecting the water-supply system.

CONSTRUCTION, REPAIR, AND MOVEMENTS OF VESSELS.

The act providing appropriations for the support of the Bureau for 1917 contained an item of $10,000 for two motor boats for the Alaska fishery patrol. Bids for the construction of these boats were opened at Seattle on December 5, 1916, seven proposals being received. The contract was awarded to a local firm, the work began at once, and the boats were completed and accepted on May 10, 1917. The contract price was $9,352, and the entire cost, including plans and inspection, was $9,702.70. The boats resemble the type of boats used in the purse-

seine fishery for salmon, carry a crew of three men, and have accommodations for two fishery agents. They are 48 feet long and 12½ feet beam, draw 5¼ feet of water, are lighted by electricity, are driven by 25 horsepower distillate engines, and have a normal speed of 8½ knots per hour. The fuel tanks have a capacity of 600 gallons, giving a radius of action of about 3,000 miles. The new boats, which have been named the *Auklet* and the *Murre*, after two common water birds of the Alaskan coast, left Seattle on July 7 for Alaska, reported at Wrangell on July 12, and immediately entered on fishery patrol work in southeast Alaska.

The steamer *Halcyon*, provided for the Boothbay Harbor station and described in last year's report, was launched November 30, 1916, and finally completed and accepted by the Bureau May 3, 1917. The vessel was immediately transferred to the Navy.

The steamer *Albatross* during the early part of the fiscal year continued the tuna investigation along the California coast until November 23, when she proceeded to San Francisco, arriving November 26. Soon afterward she was docked to ascertain what repairs and overhauling were necessary. A deficiency appropriation of $10,000 becoming available on May 2, the vessel was taken to Mare Island Navy Yard where the work was undertaken. During the year the vessel cruised 4,833 miles, using 717.9 tons of coal at a cost of $7,273.44.

The steamer *Fish Hawk* was engaged in fishery investigations in Chesapeake Bay, making trips at intervals from July 1, 1916, to March 22, 1917, since which time she has been chiefly on naval duty. Before the vessel can be used for any outside work, considerable repairs to the hull are necessary, and new engines should be provided. During the year the vessel, while employed in the service of the Bureau, cruised 681 miles, using 581 tons of coal at a cost of $1,659.47.

The steamer *Roosevelt* sailed on January 23, 1917, from Norfolk en route to Seattle, where she arrived April 23, having been detained at Guantanamo over a month on account of the international situation and at Balboa nearly three weeks for repairs. At the end of the year she was ready to transport supplies to the Pribilof Islands.

The auxiliary schooner *Grampus* was engaged from July 18, 1916, to April 24, 1917, in oceanographic and other investigations on the Atlantic coast and fishery investigations in the Gulf of Mexico. In April the vessel reached Washington, and sailed thence on May 15 for Gloucester, Mass. Defects have developed in the hull of the *Grampus* incident to age and very active and continuous service, and the question is being considered as to whether the expense of rebuilding is warranted. The vessel is of an obsolete type and not at all suited to the present needs of the Bureau.

The steamer *Phalarope* has been utilized, as usual, in connection with the hatchery and laboratory at Woods Hole, Mass., and in shad hatching on the Potomac River; and the steamer *Gannet* has been actively employed at the Boothbay Harbor (Me.) station.

PUBLICATIONS.

The publications of the Bureau issued and distributed during the fiscal year are here noted. These were supplied chiefly through the Superintendent of Documents to persons on special mailing lists.

The Fisheries Service Bulletin, issued monthly, has proved very popular and useful. It is of special interest to employees, who are

thus kept informed of the current work of the service of which they are a component part. Every employee receives a copy of each issue and maintains a file. In the course of the year it was necessary at times to increase the number of pages to accommodate all the matter desirable for publication, and the monthly edition has also been enlarged.

Effective February 1, 1917, the Bureau discontinued the free distribution of its general publications. This action was necessitated by the increasing demands and the limited allotment available for printing. Hereafter applications for publications will be referred to the Superintendent of Documents, who will supply them at prices representing the actual cost of paper and press work. The only exceptions will be institutions and specialists collaborating or exchanging with the Bureau and State and foreign fishery officials. Documents issued in the Bureau's exploitation and propaganda work, together with the Commissioner's annual report, statistical bulletins, and the Fisheries Service Bulletin, will be supplied as heretofore.

REPORT OF THE COMMISSIONER AND APPENDIXES THERETO.

Report of the Commissioner of Fisheries to the Secretary of Commerce for the fiscal year ended June 30, 1916. 114 p.

Alaska fisheries and fur industries in 1915. By Ward T. Bower and Henry D. Aller. Appendix III to Report of Commissioner for 1915. 140 p.

Pacific cod fisheries. By John N. Cobb. Appendix IV to Report of Commissioner for 1915. 111 p., 9 pl., 1 map.

Survey of the fishing grounds on the coasts of Washington and Oregon in 1915. By Edward C. Johnston. Appendix VI to Report of Commissioner for 1915. 20 p., 4 charts.

Explorations of the United States Coast and Geodetic Survey steamer "Bache" in the western Atlantic, January–March, 1914, under the direction of the United States Bureau of Fisheries. By Henry F. Bigelow. Appendix V to Report of Commissioner for 1915. 62 p., 1 chart, 53 text fig.

Distribution of fish and fish eggs during the fiscal year 1916. By Henry O'Malley. Appendix I to Report of Commissioner for 1916. 112 p.

Pacific salmon fisheries (revised edition). By John N. Cobb. Appendix III to Report of Commissioner for 1916. 255 p., 29 pl.

Fish laws of Mississippi River States: A digest of statutes relating to the protection of fish and miscellaneous aquatic animals of States bordering on the Mississippi River. By Emerson Stringham. Appendix IV to Report of Commissioner for 1916. 20 p.

Condition and extent of the natural oyster beds and barren bottoms in the vicinity of Apalachicola, Fla. By Ernest Danglade. Appendix V to Report of Commissioner for 1916. 68 p., 1 map, 7 pl.

Fishing in the Priamur district of Siberia. By John K. Caldwell. Appendix VI to Report of Commissioner for 1916. 31 p.

Mortality of fishes on the west coast of Florida. By H. F. Taylor. Appendix III to Report of Commissioner for 1917. 24 p., 4 p. of pl.

BULLETIN OF THE BUREAU OF FISHERIES.

The structure and growth of the scales of the squeteague and pigfish as indicative of life history. By H. F. Taylor. Bulletin XXXIV, 1914, p. 285–330, 8 text fig., pl. L–LIX.

Notes on the fishes of east Tennessee. By Barton W. Evermann and Samuel F. Hildebrand. Bulletin XXXIV, 1914, p. 431–451, 13 text fig.

The histological basis of adaptive shades and colors in the flounder *Paralichthys albiguttus*. By Albert Kuntz. Bulletin XXXV, 1915–16, p. 1–30, 8 text fig., pl. I–II.

SPECIAL PUBLICATIONS.

Investigations, experiments, and surveys relative to the aquatic resources of the United States conducted by the Bureau of Fisheries during the fiscal year ended June 30, 1916. Extracted from Report of the Commissioner of Fisheries to the Secretary of Commerce for the fiscal year ended June 30, 1916, p. 34–49.

Commercial fisheries of the United States and the operations of the Bureau of Fisheries in connection therewith during the fiscal year ended June 30, 1916. Extracted from the Report of the Commissioner of Fisheries to the Secretary of Commerce for the fiscal year ended June 30, 1916, p. 50–100.

The work of the Bureau of Fisheries and its fish-cultural station at Boothbay Harbor, Me. 13 p., 6 text fig.

ECONOMIC CIRCULARS.

No. 22. The grayfish. Try it. It knocks H out of the H. C. of L. 8 p., 1 text fig.

No. 23. The sablefish, alias black cod. An introduction to one of the best and richest American food fishes, with recipes for cooking it. 6 p., 1 text fig.

No. 24. Artificial propagation of the diamond-back terrapin. 21 p., 5 text fig. (Revised edition.)

No. 25. The question of fishways. 6 p.

No. 26. The burbot: A fresh-water cousin to the cod. 4 p., 1 text fig.

No. 27. The bowfin: An old-fashioned fish with a new-found use. 4 p., 1 text fig.

No. 28. A practical small smokehouse for fish. How to construct and operate it. 7 p., 3 text fig.

No. 29. Preserving fish for domestic use. 2 p.

STATISTICAL BULLETINS.

Monthly and annual statements of the quantities and values of certain fishery products landed by American fishing vessels at the ports of Gloucester and Boston, Mass., Portland, Me., and Seattle, Wash.

SOME NEEDS OF THE FISHERIES SERVICE.

The Commissioner renews his previous recommendations for a modern building with ample laboratory facilities for the Washington headquarters combined with an aquarium for experimental and observational work in fish breeding, fish feeding, and fish pathology. The aquarium should be adapted for public education and should be recognized as a national institution. The need for and benefits to be derived from such a building are fully set forth in the Secretary's communication to the Speaker of the House of Representatives on April 2, 1917, printed as House Document No. 117, Sixty-fifth Congress, first session.

In order more adequately to perform the duties devolving on the Bureau, more particularly those that have received an added importance because of the national crisis that necessitates increased output of food and industrial materials, there is urgent need for additional personnel and facilities for practical and immediately productive work in furtherance of the activities hereinbefore referred to, in behalf of the exploitation of neglected aquatic resources, the methods of preservation best adapted to the various products and communities, and the prevention of waste in all branches of the fisheries. Items have been included in the estimates of appropriations for the next fiscal year that will meet some of the Bureau's needs in respect to these matters.

Respectfully submitted.

H. M. Smith,
Commissioner of Fisheries.

To Hon. William C. Redfield,
Secretary of Commerce.

THE DISTRIBUTION OF FISH AND FISH EGGS DURING THE FISCAL YEAR 1917

HENRY O'MALLEY
Assistant in Charge of Fish Culture

Appendix I to the Report of the U. S. Commissioner of Fisheries for 1917

CONTENTS.

INDEX TO SPECIES DISTRIBUTED.

THE DISTRIBUTION OF FISH AND FISH EGGS DURING THE FISCAL YEAR 1917.

CHARACTER OF WORK.

The fish-cultural operations of the Bureau of Fisheries are directed to the restoration and maintenance of the commercial fisheries of the country and to the development and extension of the fish-producing area of its interior waters. The needs of the great fisheries industries, which embrace large investments of capital and contribute important food supplies of salmon, shad, codfish, lobster, etc., are paramount. The work of assembling and hatching the eggs of the commercial species and the liberating of the resulting fry in suitable waters have been unremittingly prosecuted by the Bureau, and there has been no relaxation of the efforts of past years to discover and develop new fields. A glance at the appended tabulation will disclose the magnitude of the distributions and the wide extent of territory covered. With an output of the size indicated it may readily be understood that it is necessary to liberate the greater portion of the fish during the very early stages of their existence.

The fishes furnished for the stocking of the streams, lakes, and ponds of the interior during the fiscal year 1917 were largely of the fingerling sizes. Of trout, grayling, and salmon it has been possible to produce requisite numbers with facility, but the species applicable to the needs of a considerable portion of the country—the so-called warm-water fishes—are in a different category, and the Bureau has been unable to supply them in numbers sufficient to meet the rapidly growing demands. The eggs of fishes of this class, owing to adhesiveness or other deterrent qualities, are not adapted to hatchery processes and resultant multiplication on a large scale. Their production is therefore limited to such numbers as the brood fishes themselves are able to bring off their nests in ponds where partial protection is afforded, and while the output of the pond fish-cultural stations is annually expanding, it is far from being adequate to satisfy public requirements.

To make up for the deficiency so far as practicable, recourse is had to collections of the young of black bass and kindred species which abound in the temporary lagoons existing at times in the high-water zones of the Mississippi and Illinois Rivers.

Early in the year these rivers overflow their banks and spread out over miles of territory, and in the warm shallows thus formed many varieties of the native game and food fishes deposit their eggs. The young fish hatched therefrom are imprisoned in immense numbers with the subsidence of the floods in the thousands of depressions ranging in depths from a few inches to several feet, and here they are preyed upon for several months by game birds and the alligator gar. Finally all that escape these enemies must perish incident to the drying of the pools in the fall. From depressions of this character the Bureau rescues many thousands of fish annually, returning by far the greater portion of them to the original streams, but culling out choice specimens to supplement its stock for distribution to applicants. This great resource is capable of being turned to highly successful account when funds are available for the extension of the rescue operations.

While only about 5 per cent of the Bureau's total output is applied to the interior waters of the country, the benefits accruing therefrom have been widely disseminated, and with the increasing cost of food materials this branch of the work is attaining greater significance. In its prosecution the Bureau has received valuable assistance from certain State fisheries authorities, club representatives, and public-spirited individuals, not only in formulating plans for but in the actual distributions of fishes. One highly important and beneficial effect of such cooperation has been the development and growth of a sentiment opposed to the ruthless and destructive fishing methods in vogue in many localities.

METHOD OF DISTRIBUTION.

The fry hatched from the shad, whitefish, salmons, lake trout, lake herring, pike perch, white perch, yellow perch, striped bass, cod, lobster, pollock, flatfish, and haddock—constituting the commercial species—are planted on the spawning grounds from which the eggs are derived or utilized for the stocking of new and suitable waters in an effort to extend the fisheries.

With respect to the game and food fishes of the interior, which are propagated in comparatively small numbers, provision is made for the return of a sufficient number of young fish to the waters where eggs are collected for the maintenance of the supply therein; the remainder of the stock is then assigned to suitable lakes or streams for which applications have been submitted by responsible individuals. This class includes the various trouts, basses, sunfishes, and catfishes.

Blanks upon which formal applications for fish can be made are furnished by the Bureau on request. Upon the receipt of applications properly executed and bearing the indorsement of a United States

Senator or Representative, an assignment of fish is made, suitable for the waters described and to the Bureau's facilities to supply, and the delivery is arranged for as soon as possible thereafter. Applicants should confine their choice of fishes to species that are indigenous to the region of the waters to be stocked. Nonindigenous species of fishes are assigned only upon the recommendation of the State fisheries authorities, and not then unless such recommendation conforms to the Bureau's judgment.

The Bureau refuses requests for such predaceous fishes as the black bass, sunfish, and kindred species for introduction into waters in California, Oregon, Washington, Idaho, Nevada, Wyoming, or western Montana, as it is believed their presence in such waters might prove harmful to the trout and salmon fisheries of that region.

Each species of fish spawns at a specific time during the year—the brook trout and the domesticated rainbow trout of eastern waters in the fall or early winter; the blackspotted trout, steelhead trout, and the wild rainbow trout of western waters during the spring; while all of the pond fishes reproduce in the spring or early summer.

The product of each season is distributed as the fish attain proper size for shipment, and after the exhaustion of the stock of one season no more are available until the same season the following year.

The distribution of trout in the Eastern States begins in March and is completed by the last of June, while trout shipments to applicants in the Middle States extend from about May 1 until well along in July. In the Rocky Mountain States the trout distributions occur somewhat later, the work usually starting by September 1 and continuing into the early winter.

The black basses produced at the Bureau's pond-cultural stations are distributed between May and August, while the miscellaneous fishes rescued from overflowed lands and the output of rock bass, crappie, sunfish, and catfish from these stations are shipped simultaneously, the distribution usually extending from August to December.

It is the policy of the Bureau to fill applications in the order of their receipt so far as practicable, but it is impossible to state definitely, in advance, when the fish requested by an applicant can be furnished, the approximate time of delivery depending upon transportation facilities, which are not always available on a given date, and, in the case of the pond or river fishes, upon the degree of success attained in the collections.

The number of fish assigned on an application must necessarily be governed by the available supply of the species requested and the time of year scheduled for the delivery, it being obvious that very young fishes which have not been fed can be furnished in much larger numbers than those which have been held at considerable expense at

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the Bureau's stations until they have attained the size of fingerlings. It is the aim of the Bureau in all cases to allot a sufficient number of a given species to form a brood stock for the water area described, and those interested in the lake or stream so stocked are relied upon to see that the fish are afforded proper protection by the restriction or prohibition of fishing until a sufficient length of time has elapsed for them to reproduce, a period which will vary from two to three years, according to the species furnished.

Fry or very young fish can be shipped in much larger numbers than those of the fingerling sizes. A 10-gallon transportation can will safely carry from 2,000 to 3,000 fry of the trouts or black basses, from 500 to 1,000 one-inch fish of these species, and of those 2 inches long, from 100 to 300. It has been calculated that the varying numbers of the different sizes stated have practically equal value for stock purposes, as the losses in open waters from natural causes are in about the ratios indicated.

Some of the commercial species propagated—whitefish, pike perch, white perch, and shad, which are distributed only as fry—are so small that as many as 100,000 can be carried in a 10-gallon can.

Fish intended for applicants are carried to destination in specially equipped railroad cars belonging to the Bureau, or in the regular baggage cars attached to passenger trains, an experienced messenger accompanying them for the purpose of aerating the water en route. The only expense the applicant is put to in connection with the transaction is that of transporting the fish from the railroad station designated in the application to the waters in which they are to be liberated. Some days in advance of an intended delivery the consignee is notified and given detailed instructions regarding the reception and care of the fish after they are turned over to him. He is notified again by wire a few hours before the arrival, in order that he may meet the train and receive the consignment, which will be handed to him from the car by the messenger.

During the fiscal year ended June 30, 1917, the Bureau received 11,208 applications from individuals and associations for fish to stock public and private waters. Requests for blanks upon which to submit applications for fish should be addressed to the Commissioner of Fisheries, Washington, D. C.

SPECIES CULTIVATED.

During the fiscal year 1917 the Bureau handled some 50 species of fish and the lobster. Of these the following were produced at its regular propagating stations:

THE CATFISHES (SILURIDÆ):
- Horned pout, bullhead, yellow cat (*Ameiurus nebulosus*).
- Marbled cat (*Ameiurus nebulosus marmoratus*).

THE SUCKERS AND BUFFALOFISHES (CATOSTOMIDÆ):
- Smallmouth buffalofish (*Ictiobus bubalus*).
- Common buffalofish (*Ictiobus cyprinella*).
- Black buffalofish (*Ictiobus urus*).

THE SHADS AND HERRINGS (CLUPEIDÆ):
- Shad (*Alosa sapidissima*).

THE SALMONS, TROUTS, WHITEFISHES, ETC. (SALMONIDÆ):
- Common whitefish (*Coregonus albus* and *C. clupeaformis*).
- Lake herring, cisco (*Leucichthys artedi*).
- Chinook salmon, king salmon, quinnat salmon (*Oncorhynchus tschawytscha*).
- Silver salmon, coho (*Oncorhynchus kisutch*).
- Blueback salmon, redfish, sockeye (*Oncorhynchus nerka*).
- Humpback salmon (*Oncorhynchus gorbuscha*).
- Chum salmon (*Oncorhynchus keta*).
- Steelhead (*Salmo gairdneri*).
- Rainbow trout (*Salmo irideus*).
- Atlantic salmon (*Salmo salar*).
- Landlocked salmon (*Salmo sebago*).
- Blackspotted trouts: Yellowstone Lake trout or cutthroat trout (*Salmo lewisi*); Tahoe trout (*Salmo henshawi*).
- Scotch sea trout (*Salmo trutta*). Introduced species.
- Loch Leven trout (*Salmo trutta levenensis*). Introduced species, propagated in limited numbers for observation.
- Lake trout, Mackinaw trout, longe, togue (*Cristivomer namaycush*).
- Brook trout, speckled trout (*Salvelinus fontinalis*).
- Sunapee Lake trout (*Salvelinus aureolus*).

THE SMELTS (ARGENTINIDÆ):
- American smelt (*Osmerus mordax*).

THE GRAYLINGS (THYMALLIDÆ):
- Montana grayling (*Thymallus montanus*).

THE MACKERELS (SCOMBRIDÆ):
- Common mackerel (*Scomber scombrus*).

THE BUTTERFISHES (STROMATEIDÆ):
- Butterfish (*Poronotus triacanthus*).

THE BASSES, SUNFISHES, AND CRAPPIES (CENTRARCHIDÆ):
- Crappie (*Pomoxis annularis*).
- Strawberry bass, calico bass (*Pomoxis sparoides*).
- Rock bass, red-eye, goggle-eye (*Ambloplites rupestris*).
- Warmouth, goggle-eye (*Chænobryttus gulosus*).
- Smallmouth black bass (*Micropterus dolomieu*).
- Largemouth black bass (*Micropterus salmoides*).
- Bluegill bream, bluegill sunfish (*Lepomis incisor*).
- Other sunfishes, chiefly *Eupomotis gibbosus*.

THE PERCHES (PERCIDÆ):
- Pike perch, wall-eyed pike, yellow pike, blue pike (*Stizostedion vitreum*).
- Yellow perch, ring perch (*Perca flavescens*).

THE SEA BASSES (SERRANIDÆ):
- Striped bass, rockfish (*Roccus lineatus*).
- White perch (*Morone americana*).

THE CODS (GADIDÆ):
- Cod (*Gadus callarias*).
- Haddock (*Melanogrammus æglifinus*).
- Pollock (*Pollachius virens*).

THE FLOUNDERS (PLEURONECTIDÆ):
- Winter flounder, American flatfish (*Pseudopleuronectes americanus*).

CRUSTACEANS:
- American lobster (*Homarus americanus*).

The fishes rescued from overflowed lands in the Mississippi Basin and returned to the original streams were as follows:

THE CATFISHES (SILURIDÆ):
- Spotted cat, blue cat, channel cat (*Ictalurus punctatus*).
- Horned pout, bullhead, yellow cat (*Ameiurus nebulosus*).

THE SUCKERS AND BUFFALOFISHES (CATOSTOMIDÆ):
- Common sucker (*Catosomus commersonii*).
- Black sucker (*Hypentelium nigricans*).
- Smallmouth buffalofish (*Ictiobus bubalus*).
- Common buffalofish (*Ictiobus cyprinella*).
- Black buffalofish (*Ictiobus urus*).

THE MINNOWS AND CARPS (CYPRINIDÆ):
- Carp (*Cyprinus carpio*).

THE PIKES AND PICKERELS (ESOCIDÆ):
- Pike (*Esox lucius*).
- Pickerel (*Esox reticulatus*).

THE BASSES, SUNFISHES, AND CRAPPIES (CENTRARCHIDÆ):
- Crappie (*Pomoxis annularis*).
- Rock bass, red-eye, goggle-eye (*Ambloplites rupestris*).
- Warmouth, goggle-eye (*Chænobryttus gulosus*).
- Largemouth black bass (*Micropterus salmoides*).
- Smallmouth black bass (*Micropterus dolomieu*).
- Bluegill bream, bluegill sunfish (*Lepomis incisor*).
- Other sunfishes, chiefly *Eupomotis gibbosus*.

THE PERCHES (PERCIDÆ):
- Yellow perch, ring perch (*Perca flavescens*).

THE SEA BASSES (SERRANIDÆ):
- White bass (*Roccus chrysops*).
- Yellow bass (*Morone interrupta*).

SUMMARIZED STATEMENT OF DISTRIBUTION.

The following table shows the number of fish and eggs actually distributed during the fiscal year 1917, or, in other words, the output of the hatcheries, with all losses in transportation deducted:

Summary, by Species, of the Distribution of Fish and Eggs During the Fiscal Year Ended June 30, 1917.

Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Catfish			4,251,289	4,251,289
Carp		112,000	605,407	717,407
Buffalofish		6,754,000	207,898	6,961,898
Suckers			748	748
Shad		77,946,000		77,946,000
River herring			177,000	177,000
Whitefish	52,602,500	331,610,000		384,212,500
Lake herring (cisco)		82,550,000		82,550,000
Silver salmon		4,403,700	4,662,960	9,066,660
Chinook salmon	7,191,200	16,404 404	27,065 581	50,661,185
Blueback salmon	2,000,000	75,038,525	5,793.953	82,832,478
Humpback salmon		27,406,204	7,449 030	34,855,234
Chum salmon		14,403,300	7,014.580	21,417 880
Steelhead trout	3,237,600	2,040,710	2,061,709	7,340.019
Rainbow trout	1,454,200	250,200	2,574,942	4,279,342
Atlantic salmon		3,028,850	887	3,029,737
Landlocked salmon	531,000	798,689	177,635	1,507,324
Blackspotted trout	1,630,000	2,051,400	2,683,900	6,365,300
Loch Leven trout			25,860	25,860
Lake trout	35,332,000	33,395,155	3,699,158	72,426,313
Brook trout	935,600	5,972,495	7,868,932	14,777,027
Sunapee trout		8,000		8,000
Grayling	125,000	1,078,000		1,203,000
Smelt		28,000,000		28,000,000
Pike and pickerel			103,643	103,643
Freshwater drum			29,804	29,804
Crappies			1,565,072	1,565,072
Largemouth black bass		320,050	961,912	1,281,962
Smallmouth black bass		237,600	149,837	387,437
Rock bass			91,742	91,742
Warmouth bass			2,400	2,400
Sunfish			2,670,513	2,670,513
Pike perch	212,900,000	174,097,500	15,874	387,013,374
Yellow perch		175,421,000	163,839	175,584,839
White perch		32,625,000		32,625,000
White bass			15,298	15,298
Yellow bass			15	15
Striped bass		16,137,000		16,137,000
Mackerel		2,341,000		2,341,000
Butterfish		920,000		920,000
Cod	1,000,000	236,786,000	2,648	237,788,648
Pollock		1,474,096,000		1,474,096,000
Haddock		6,720,000		6,720,000
Flounder		1,814,696,000		1,814,696,000
Miscellaneous fishes			15,945	15,945
Lobster		110,260,000	5,400	110,265,400
Total	318,939,100	4,757,908,782	82,115,411	5,158,963,293

Allotments of Fish and Eggs to State Fish Commissions, Fiscal Year 1917.

State and species.	Eggs and fry.[a]	Fingerlings, yearlings, and adults.
California: Chinook salmon	7,027,300	....
Illinois:		
Black bass	....	7,000
Brook trout	50,000	....
Catfish	....	10,500
Crappie	....	300
Pike perch	15,000,000	....
Rainbow trout	50,000	....
Sunfish	....	4,000
Whitefish	5,000,000	....
Yellow perch	....	250
Indiana: Pike perch	15,000,000	....
Iowa:		
Brook trout	50,000	....
Lake trout	100,000	....
Pike perch	40,000,000	....
Kentucky:		
Black bass	....	88
Chinook salmon	....	6,000
Crappie	....	2,800
Pike perch	*5,000,000	....
Rainbow trout	....	10,000
Rock bass	....	1,050
Sunfish	....	4,200
Maine:		
Brook trout	100,000	....
Lake trout	200,000	....
Landlocked salmon	401,000	....
Massachusetts: Catfish	....	12,500
Michigan:		
Grayling	50,000	....
Lake trout	8,640,000	....
Pike perch	{ *2,000,000 40,000,000	....
Whitefish	*250,000	....
Minnesota:		
Lake trout	3,300,000	....
Steelhead	200,000	....
Whitefish	122,500	....
Missouri: Rainbow trout	98,400	....
Montana:		
Black bass	....	7,500
Blackspotted trout	400,000	....
Catfish	....	2,000
Rainbow trout	150,000	....
Whitefish	300,000	....
Nebraska: Pike perch	9,800,000	....
Nevada: Brook trout	150,000	....
New Hampshire:		
Brook trout	50,000	....
Landlocked salmon	25,000	....
Rainbow trout	100,000	....
New Jersey:		
Rainbow trout	50,000	....
Smallmouth black bass	....	1,500
Steelhead	100,000	....
New York:		
Lake trout	5,490,000	....
Landlocked salmon	25,000	....
Pike perch	*6,600,000	....
Steelhead	500,000	....
Yellow perch	*250,000	....
North Dakota:		
Pike perch	3,000,000	....
Steelhead	100,000	....
Ohio:		
Lake trout	600,000	....
Pike perch	73,600,000	....
Whitefish	40,980,000	....
Oklahoma:		
Black bass	....	70
Catfish	....	10
Rock bass	....	80
Sunfish	....	90
Yellow perch	*100,000	60
Oregon:		
Blackspotted trout	250,000	....
Blueback salmon	2,000,000	....
Chinook salmon	163,900	60,000
Lake trout	1,000,000	....
Silver salmon	....	10,000
Steelhead	1,687,600	....
Pennsylvania:		
Lake trout	1,000,000	....
Rainbow trout	50,000	....
Pike perch	8,000,000	....
South Dakota:		
Blackspotted trout	*30,000	....
Brook trout	....	23,150
Pike perch	3,000,000	....
Utah: Blackspotted trout	100,000	....
Vermont:		
Channel catfish	....	100
Lake trout	1,500,000	....
Landlocked salmon	40,000	....
Steelhead	200,000	....
Washington: Blackspotted trout	200,000	....
Wisconsin:		
Lake trout	13,000,000	....
Whitefish	5,000,000	....
Wyoming:		
Blackspotted trout	300,000	....
Lake trout	200,000	....
Rainbow trout	100,000	....
Steelhead	100,000	....
Total	{ *14,230,000 308,700,700	} 163,248

[a] Fry are indicated by an asterisk, thus (*); all others are eggs.

Shipments of Fish and Eggs to Canal Zone and Foreign Countries During Fiscal Year 1917.

Country and species.	Eggs.	Fingerlings.
Canada: Rainbow trout	96,000	....
Japan:		
Brook trout	100,000	....
Rainbow trout	101,000	....
Canal Zone:		
Black bass	....	450
Catfish	....	1,000
Rock bass	....	500
Sunfish	....	800
Total	297,000	2,750

DETAILS OF OUTPUT FOR 1917.

The following table shows the work of the different stations in 1917, the period of operations, and the eggs and fish furnished by each station for distribution. It will be noted that transfers of fish and eggs from station to station are frequent. Such transfers are made in the interest of economy and convenience where the shipments consist of eggs, and give advantageous distribution centers in the case of young fish.

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1917.

[NOTE.—See explanations of this table on p. 17.]

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Afognak, Alaska:[a] Entire year	Blueback salmon		13,576,700	2,200,000	15,776,700
	Humpback salmon		19,343,000		19,343,000
Baird, Cal.: Entire year	Brook trout			26,000	26,000
	Chinook salmon			3,702,000	3,702,000
	Rainbow trout			19,450	19,450
Battle Creek, Cal.[b]— Dec.–Apr.	Chinook salmon	5,000,000		5,695,300	10,695,300
Hornbrook, Cal.— Jan.–May	Chinook salmon	1,000,000	800,000	368,000	2,168,000
	Rainbow trout	175,000	11,200		186,200
	Silver salmon		50,000	11,000	61,000
Mill Creek, Cal.[c]— Dec.–Apr.	Chinook salmon	1,027,300		4,863,000	5,890,300
Baker Lake, Wash.: Entire year	Blueback salmon		711,825	1,996,000	2,807,825
	Chinook salmon		85,581		85,581
	Silver salmon			508,900	508,900
	Steelhead		66,510		66,510
Birdsview, Wash.[d]— Entire year	Blueback salmon			97,000	97,000
	Chum salmon			928,010	928,010
	Humpback salmon		165,000	3,563,810	3,728,810
	Silver salmon			1,980,000	1,980,000
	Steelhead	550,000		1,424,000	1,974,000
Brinnon, Wash.— Entire year	Chum salmon		892,800		892,800
	Silver salmon		197,400		197,400
	Steelhead		242,800		242,800
Darrington, Wash.— Apr.–June	Chum salmon		277,000		277,000
	Silver salmon		700,000		700,000
Duckabush, Wash.— Entire year	Chinook salmon			706,507	706,507
	Chum salmon		2,402,000	5,838,520	8,240,520
	Humpback salmon			1,960,120	1,960,120
	Silver salmon		38,000	1,823,960	1,861,960
	Steelhead		689,700		689,700
Illabott Creek, Wash.— Oct.–June	Chinook salmon			44,105	44,105
	Chum salmon		1,831,000		1,831,000
	Silver salmon		259,600		259,600
Quilcene, Wash.— Entire year	Chum salmon		7,553,000		7,553,000
	Humpback salmon			1,925,100	1,925,100
	Silver salmon			247,000	247,000
	Steelhead		626,500		626,500
Sultan, Wash.— Entire year	Silver salmon		855.000		855,000
	Steelhead		353,500		353,500
Boothbay Harbor, Me.: Entire year	Flounder		966,266,000		966,266,000
	Lobster		110,000,000	5,400	110,005,400
	Pollock		3,346,000		3,346,000
Bozeman, Mont.:[e] Entire year	Blackspotted trout		1,072,000		1,072,000
	Brook trout			363,850	363,850
	Grayling	125,000	968,000		1,093,000
	Lake trout			37,500	37,500
	Rainbow trout	253,000	60,000	664,100	977,100
	Steelhead			10,000	10,000

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1917—Contd

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Bozeman, Mont.—Contd.					
Yellowstone, Wyo.[f]— July-Sept.	Blackspotted trout	1,630,000	193,000		1,823,000
Bryans Point, Md.:[g] Mar.-May	Shad		68,665,000		68,665,000
	Yellow perch		130,370,000		130,370,000
Cape Vincent, N. Y.: Entire year	Brook trout		831,000		831,000
	Lake herring		82,550,000		82,550,000
	Lake trout		6,315,155		6,315,155
	Landlocked salmon		4,970		4,970
	Pike perch		10,875,000		10,875,000
	Rainbow trout		91,000		91,000
	Whitefish		19,550,000		19,550,000
	Yellow perch		26,000,000	50,000	26,050,000
Central Station, Washington, D. C.: Entire year	Black bass			700	700
	Brook trout		16,000		16,000
	Catfish			275	275
	Crappie			350	350
	Pike perch		1,200,000		1,200,000
	Rainbow trout		8,000		8,000
	Rock bass			200	200
	Shad		600,000		600,000
	Smallmouth black bass			320	320
	Suckers			100	100
	Sunfish			1,525	1,525
	Whitefish		630,000		630,000
	Yellow perch			1,385	1,385
Clackamas, Oreg.: Entire year	Brook trout			127,000	127,000
	Chinook salmon			3,991,700	3,991,700
	Rainbow trout			40,000	40,000
	Silver salmon			14,400	14,400
	Steelhead			20,000	20,000
Applegate, Oreg.— Apr.-June	Chinook salmon		171,500		171,500
	Silver salmon		393,700		393,700
	Steelhead	2,287,600	34,500		2,322,100
Big White Salmon, Wash.— Dec.-Mar	Chinook salmon		4,310,958	567,290	4,878,248
Snake River, Oreg.— Oct	do	163,900			163,000
Little White Salmon, Wash.[h]— July-May	do		10,413,365	4,547,279	14,960,644
	Chum salmon		1,447,500	248,050	1,695,550
Rogue River, Oreg.— Entire year	Blackspotted trout			8,000	8,000
	Chinook salmon			1,758,800	1,758,800
	Silver salmon			6,000	6,000
	Steelhead			128,600	128,600
Upper Clackamas, Oreg.— Entire year	Chinook salmon		463,000	815,600	1,278,600
	Silver salmon			71,700	71,700
	Steelhead	400,000		318,850	718,850
Willamette, Oreg.— July and June	Shad		2,351,000		2,351,000
Cold Springs, Ga.: Entire year	Black bass		46,000	134,120	180,120
	Catfish			4,525	4,525
	Sunfish			57,525	57,525
Milltown, Ga.— May	Black bass			100,000	100,000
Craig Brook, Me.: Entire year	Atlantic salmon		3,028,850	887	3,029,737
	Brook trout		962,000	41,300	1,003,300
	Humpback salmon		3,961,439		3,961,439
	Landlocked salmon		7,480	20,850	28,330
Duluth, Minn.: Entire year	Brook trout		152,000	364,500	561,500
	Lake trout	4,200,000	11,453,000	3,502,000	19,155,000
	Pike perch		5,087,500		5,087,500
	Steelhead			105,000	105,000
	Whitefish	122,500	7,130,000		7,252,500
Edenton, N. C.: Entire year	Black bass		19,100	37,600	56,700
	Shad		6,060,000		6,060,000
	Sunfish			7,900	7,900
	White perch		32,625,000		32,625,000

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1917—Contd.

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Edenton, N. C.—Contd.					
Weldon, N. C.— Apr.-May	Striped bass		16,137,000		16,137,000
Erwin, Tenn.:[j] Entire year	Black bass		27,000	2,690	29,690
	Brook trout			182,425	182,425
	Carp			2,000	2,000
	Rainbow trout			332,502	332,502
	Rock bass			25,450	25,450
	Smallmouth black bass		11,000	1,700	12,700
	Sunfish			8,135	8,135
Fairport, Iowa: Entire year	Black bass			6,349	6,349
	Buffalofish		6,754,000	2,737	6,756,737
	Carp		112,000	4,741	116,741
	Catfish			112,952	112,952
	Crappie			43,335	43,335
	Drum			529	529
	Pickerel			205	205
	Pike perch			606	606
	Sunfish			69,424	69,424
	White bass			498	498
	Yellow perch			305	305
	Miscellaneous			3,557	3,557
Black River, Ark.— Oct.-Dec	Black bass			803	803
	Buffalofish			123	123
	Carp			6	6
	Catfish			15,232	15,232
	Crappie			1,900	1,900
	Pike perch			83	83
	Suckers			186	186
	Sunfish			3,904	3,904
	Miscellaneous			1,922	1,922
Cumberland River, Ky.— Nov.-Dec	Black bass			136	136
	Crappie			4,921	4,921
	Sunfish			2,831	2,831
	Miscellaneous			1,041	1,041
Lake Cooper, Ill.— Aug.-Dec	Black bass			192	192
	Buffalofish			788	788
	Carp			449	449
	Catfish			32	32
	Crappie			1,104	1,104
	Pickerel			33	33
	Pike perch			11	11
	Sunfish			689	689
	Yellow perch			47	47
	Miscellaneous			398	398
Lake Pepin, Minn.— Sept.-Nov	Black bass			2,970	2,970
	Buffalofish			1,099	1,099
	Carp			6,921	6,921
	Catfish			716,772	716,772
	Crappie			13,325	13,325
	Pickerel			946	946
	Pike perch			59	59
	Suckers			462	462
	Sunfish			11,977	11,977
	Yellow perch			4,970	4,970
	Miscellaneous			9,017	9,017
Gloucester, Mass.:[k] Entire year	Butterfish		920,000		920,000
	Cod		66,610,000		66,610,000
	Flounder		169,660,000		169,660,000
	Haddock		6,720,000		6,720,000
	Lobster		260,000		260,000
	Mackerel		495,000		495,000
	Pollock		1,470,750,000		1,470,750,000
Green Lake, Me.: Entire year	Brook trout		1,358,676		1,358,676
	Humpback salmon		3,950,100		3,950,100
	Landlocked salmon	301,000	592,719	80,000	973,719
	Smelt		28,000,000		28,000,000
	Steelhead		27,200		27,200
Grand Lake Stream, Me.[l]— Sept.-June	Brook trout		23,600		23,600
	Landlocked salmon	234,000	234,000	73,814	537,814

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1917—Contd.

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Homer, Minn.:[m]					
Entire year	Black bass			58,731	58,731
	Brook trout		40,500		40,500
	Buffalofish			76,725	76,725
	Carp			443,053	443,053
	Catfish			1,571,442	1,571,442
	Crappie			677,782	677,782
	Drum			200	200
	Pike and pickerel			38,909	38,909
	Pike perch		9,950,000	2,615	9,952,615
	Rainbow trout			14,200	14,200
	Rock bass			124	124
	Sunfish			442,786	442,786
	Yellow perch		150,000	50,505	200,505
La Crosse, Wis.:					
Entire year	Black bass			57,100	57,100
	Brook trout			130,330	130,330
	Buffalofish			12,500	12,500
	Carp			78,000	78,000
	Catfish			805,600	805,600
	Crappie			219,310	219,310
	Drum			26,000	26,000
	Pike and pickerel			26,500	26,500
	Pike perch			12,500	12,500
	Rock bass			1,330	1,330
	Strawberry bass			10,000	10,000
	Sunfish			293,000	293,000
	White bass			10,300	10,300
	Yellow perch			34,050	34,050
Leadville, Colo.:[n]					
Entire year	Blackspotted trout			1,839,000	1,839,000
	Brook trout	925,000		3,312,800	4,237,800
	Grayling		110,000		110,000
	Lake trout			50,000	50,000
	Rainbow trout			151,000	151,000
Louisville, Ky.:					
Entire year	Black bass			6,090	6,090
	Chinook salmon			6,000	6,000
	Crappie			1,575	1,575
	Pike perch		8,800,000		8,800,000
	Rainbow trout			10,000	10,000
	Rock bass			2,525	2,525
	Smallmouth black bass			5,500	5,500
	Sunfish			10,175	10,175
Mammoth Spring, Ark.:					
Entire year	Black bass			6,555	6,555
	Catfish			207	207
	Rock bass			14,753	14,753
	Smallmouth black bass			50,065	50,065
	Sunfish			25,562	25,562
Friars Point, Miss.:					
July-Dec	Black bass			7,587	7,587
	Buffalofish			3,296	3,296
	Carp			1,847	1,847
	Catfish			9,952	9,952
	Crappie			7,320	7,320
	Rock bass			1,110	1,110
	Sunfish			49,768	49,768
Manchester, Iowa.:[o]					
Entire year	Brook trout			529,607	529,607
	Rainbow trout	391,000		125,250	516,250
	Rock bass			9,555	9,555
	Smallmouth black bass		3,000	200	3,200
Bellevue, Iowa[p]—					
Aug.-Dec	Black bass			73,356	73,356
	Buffalofish			47,400	47,400
	Carp			33,300	33,300
	Catfish			386,065	386,065
	Crappie			194,278	194,278
	Drum			1,875	1,875
	Pike and pickerel			8,900	8,900
	Strawberry bass			105	105
	Sunfish			783,750	783,750
	Warmouth bass			400	400
	White bass			4,500	4,500
	Yellow perch			3,010	3,010

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1917—Contd.

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Manchester, Iowa—Contd. North McGregor, Iowa[q]— Aug.-Dec	Black bass			84,200	84,200
	Buffalofish			55,060	55,060
	Carp			26,290	26,290
	Catfish			582,690	582,690
	Crappie			271,850	271,850
	Pike and pickerel			20,050	20,050
	Rock bass			200	200
	Sunfish			487,676	487,676
	Yellow perch			12,120	12,120
Galena, Ill.— Nov	Black bass			8,000	8,000
	Buffalofish			8,000	8,000
	Carp			8,800	8,800
	Catfish			46,500	46,500
	Crappie			93,000	93,000
	Drum			1,200	1,200
	Pike and pickerel			8,100	8,100
	River herring			177,000	177,000
	Sunfish			193,000	193,000
	Warmouth bass			2,000	2,000
	Yellow perch			3,700	3,700
Nashua, N. H.: Entire year	Brook trout			817,200	817,200
	Lake trout			60,600	60,600
	Rainbow trout			77,000	77,000
	Smallmouth black bass		6,000	11,435	17,435
Neosho, Mo.:[r] Entire year	Black bass		950	24,033	24,983
	Crappie			5,750	5,750
	Rainbow trout	98,400		56,066	154,466
	Rock bass			8,530	8,530
	Smallmouth black bass		600	1,503	2,103
	Sunfish			24,440	24,440
	Yellow perch		201,000	1,174	202,174
Northville, Mich.:[s] Entire year	Blackspotted trout		5,000		5,000
	Brook trout		608,000	110,000	718,000
	Lake trout	31,132,000	864,000		31,996,000
	Rainbow trout		33,000	12,000	45,000
	Smallmouth black bass		111,000	73,025	184,025
Alpena, Mich.— Apr.-May	Lake trout		3,298,000		3,298,000
	Whitefish		25,800,000		25,800,000
Charlevoix, Mich.[t]— Apr.-May	Lake trout		10,500,000		10,500,000
	Whitefish		30,000,000		30,000,000
Detroit, Mich.— Dec.-June	Pike perch	40,500,000	9,750,000		50,250,000
	Whitefish		40,000,000		40,000,000
Orangeburg, S. C.: Entire year	Black bass			142,672	142,672
	Sunfish			60,700	60,700
	Shad		270,000		270,000
Put in Bay, Ohio:[u] Entire year	Lake trout		990,000		990,000
	Pike perch	172,000,000	115,500,000		287,500,000
	Whitefish	52,480,000	208,500,000		260,980,000
Quinault, Wash.:[v] Entire year	Blueback salmon		11,150,000	52,953	11,202,953
	Chinook salmon		160,000		160,000
	Silver salmon		1,910,000		1,910,000
Quincy, Ill.:[w] Entire year	Black bass			35,578	35,578
	Buffalofish			170	170
	Catfish			2,200	2,200
	Crappie			20,168	20,168
	Pike perch		1,450,000		1,450,000
	Rock bass			24	24
	Sunfish			65,604	65,604
	Yellow bass			15	15
	Yellow perch			1,217	1,217
St. Johnsbury, Vt.. Entire year	Brook trout	7,000	1,340,209	61,920	1,409,120
	Lake trout			9,488	9,488
	Landlocked salmon			7,761	7,761
	Rainbow trout			24,000	24,000
	Smallmouth black bass		3,000	4,611	7,611

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1917—Contd.

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
St. Johnsbury, Vt.—Con. Entire year	Steelhead			32,750	32,750
	Sunapee trout		8,000		8,000
	Yellow perch			1,356	1,356
Berkshire, Mass.—Entire year	Brook trout		77,000	179,995	256,995
Holden, Vt.—Entire year	Brook trout		569,500	2,300	571,800
	Lake trout			8,635	8,635
	Landlocked salmon			4,260	4,260
	Rainbow trout			1,007	1,007
	Steelhead			16,509	16,509
Swanton, Vt.—Apr.-May	Pike perch		11,900,000		11,900,000
	Yellow perch		18,700,000		18,700,000
San Marcos, Tex.: Entire year	Black bass		5,000	85,656	90,656
	Crappie			30	30
	Rock bass			12,991	12,991
	Sunfish			22,522	22,522
Saratoga, Wyo.:[x] Entire year	Blackspotted trout		185,000	685,000	870,000
	Brook trout			45,000	45,000
	Rainbow trout			212,000	
	Steelhead			9,500	9,500
Spearfish, S. Dak.: Entire year	Blackspotted trout		597,400	166,400	763,800
	Brook trout			707,650	707,650
	Lake trout			32,500	32,500
	Loch Leven trout			25,860	25,860
	Rainbow trout		47,000	101,600	148,600
Tupelo, Miss.: Entire year	Black bass		222,000	78,015	300,015
	Catfish			800	800
	Crappie			125	125
	Sunfish			48,450	48,450
White Sulphur Springs, W. Va.: Entire year	Black bass			1,300	1,300
	Brook trout	3,600		770,055	773,655
	Rainbow trout	6,800		248,600	255,400
	Smallmouth black bass		92,000	1,500	93,500
	Sunfish			6,000	6,000
Woods Hole, Mass.:[y] Entire year	Cod	1,000,000	170,178,000	2,648	171,180,648
	Flounder		678,770,000		678,770,000
	Mackerel		1,846,000		1,846,000
Wytheville, Va.:[z] Entire year	Black bass			10,030	10,030
	Brook trout			97,900	97,900
	Rainbow trout	530,000		506,445	1,036,445
	Rock bass			15,350	15,350
	Smallmouth black bass		11,000	1,295	12,295
	Sunfish			1,570	1,570
Yes Bay, Alaska: Entire year	Blueback salmon	2,000,000	49,600,000	1,448,000	53,048,000
Total output		318,939,100	4,758,402,117	82,190,463	5,159,531,680
Lost in transit			493,335	75,052	568,387
Net output		318,939,100	4,757,908,782	82,115,411	5,158,963,293

TRANSFER NOTES TO PRECEDING TABLE.

For convenience in handling, transfers were made as follows:

a Afognak to Craig Brook, 4,096,000; to Green Lake, 4,106,752; to Birdsview, 4,000,000; to Duckabush, 2,000,000; to Quilcene, 2,000,000 humpback salmon eggs.
b Battle Creek to Baird, 2,598,500 chinook salmon eggs.
c Mill Creek to Baird, 413,300 chinook salmon eggs.
d Birdsview to Central Station, 20,000 chinook salmon eggs; to Duluth, 100,000; to Leadville, 100,000; to Green Lake, 50,000; to Saratoga, 100,000; to St. Johnsbury, 100,000; to Holden, 50,000 steelhead trout eggs.
e Bozeman to Leadville, 175,000 grayling eggs; to Wytheville, 25,000; to Leadville, 100,000; to Clackamas, 237,000 rainbow trout eggs.
f Yellowstone to Leadville, 2,015,400; to Spearfish, 975,000; to Saratoga, 890,000 blackspotted trout eggs.
g Bryans Point to Central Station, 2,600,000 yellow perch eggs.
h Little White Salmon to Louisville, 20,000 chinook salmon eggs.
i Duluth to Leadville, 50,000; to Spearfish, 50,000; to Bozeman, 50,000 lake trout eggs.
j Erwin to Orangeburg, 4,000 rock bass fingerlings.
k Gloucester to Boothbay Harbor, 34,430,000 pollock eggs.
l Grand Lake Stream to St. Johnsbury, 30,000; to Cape Vincent, 5,000; to Craig Brook, 10,000 landlocked salmon eggs.
m Homer to San Marcos, 8,600 crappie fingerlings; to North McGregor, 600 sunfish; 7,200 catfish fingerlings.
n Leadville to Bozeman, 800,000; to Homer, 200,000; to Spearfish, 1,000,000; to Baird, 50,000; to Saratoga, 500,000; to La Crosse, 100,000 brook trout eggs.
o Manchester to Northville, 100,000; to Homer, 101,000 rainbow trout eggs.
p Bellevue to Neosho, 3,300 catfish; to San Marcos, 3,625 crappie fingerlings.
q North McGregor to San Marcos, 5,900 crappie fingerlings.
r Neosho to Quincy, 4,000 rock bass fingerlings; to Erwin, 385,725; to Clackamas, 48,675 rainbow trout eggs.
s Northville to Cape Vincent, 9,400,000; to Put in Bay, 2,000,000; to Central Station, 20,000; to Alpena, 4,460,000; to Nashua, 75,000; to Charlevoix, 1,950,000 lake trout eggs.
t Charlevoix to Cape Vincent, 1,750,000 lake trout eggs.
u Put in Bay to Detroit, 45,680,000; to Duluth, 25,000,000; to Central Station, 1,000,000 whitefish eggs; to Duluth, 17,850,000; to Homer, 10,000,000; to Cape Vincent, 2,000,000; to Central Station, 3,000,000; to Quincy, 3,000,000; to Louisville, 10,000,000 pike perch eggs.
v Quinault to Birdsview, 225,000 blueback salmon eggs.
w Quincy to Tupelo, 375 yellow perch; to San Marcos, 4,000 crappie; to Orangeburg, 340 crappie; 800 catfish; to Cold Springs, 1,500 sunfish fingerlings.
x Saratoga to Neosho, 25,200 rainbow trout eggs.
y Woods Hole to Gloucester, 5,810,000 cod eggs.
z Wytheville to Cold Springs, 7,500 rock bass fingerlings; to Louisville, 25,000; to Manchester, 25,000; to Nashue, 100,000; to St. Johnsbury, 100,000; to Central Station, 20,000; to White Sulphur Springs, 200,000 rainbow trout eggs.

The eggs hatched at the main stations listed in the foregoing table are in many cases obtained from auxiliary sources, usually temporary stations occupied during the season only or, in some instances, mere camps which are shifted from year to year. In the Great Lakes and off the New England coast collections are made by the Bureau's vessels or boats in favorable localities. The following temporary stations and collecting points furnished eggs of the given species for the main hatcheries during 1917.

LIST OF EGG-COLLECTING STATIONS, FISCAL YEAR 1917.

Station.	Period of operation.	Species handled.
Alaska:		
Seal Harbor	June-October	Blueback salmon.
Smeaton Bay	August-September	Do.
Uganak	June-October	Do.
Colorado:		
Antero Lake	April-May	Rainbow trout.
Crystal Lake	November	Brook trout.
Engelbrecht Lakes	October-November	Do.
Hossellkus Lake	do	Do.
Musgrove Lakes	do	Do.
Northfield Lake	do	Do.
Smith Ponds	do	Do.
Turquoise Lake	do	Do.
Uneva Lake	do	Do.
Woodland Park Lake	do	Do.
Seven Lakes	June	Blackspotted trout.
Maine: Portland	July-October, May, and June.	Lobster.
Massachusetts:		
Menemsha	January-April	Flounder.
Waquoit	do	Do.
Michigan:		
Bay City	April	Pike perch.
Bay Port	November	Whitefish.
Brevort	do	Do.
Belle Isle	October-November	Do.
Charity Island	do	Do.
Cheboygan	do	Lake trout.
Detour	do	Do.
Fairport	do	Do.
Frankfort	do	Do.
Grand Haven	do	Do.
Isle Royal	do	Lake trout and whitefish.
Keystone	do	Lake trout.
Leland	do	Lake trout and whitefish.
Manistique	do	Lake trout.
Marquette	do	Do.
Monroe	April and November	Pike perch and whitefish.
Munising	October-November	Lake trout.
Munoscong	April	Pike perch.
Naubinway	November-December	Whitefish.
Northport	do	Lake trout and whitefish.
Ontonagon	October-November	Lake trout.
St. Ignace	do	Do.
St. James	do	Lake trout and whitefish.
St. Joseph	do	Lake trout.
Portage	do	Do.
South Manitou	December	Whitefish.
Port Lookout	do	Do.
Minnesota:		
Grand Marais	October-December	Lake trout and whitefish.
Susie Island	November	Lake trout.
Montana:		
O'Dell Creek	March-May	Grayling.
South Meadow Creek	do	Grayling and rainbow trout.
New York:		
Chaumont	November-December	Whitefish.
Galloo Island	October-November	Lake trout.
Grassy Bay	May	Yellow perch.
Henderson Harbor	November-December	Lake herring.
Ogdensburg	April-May	Pike perch.
Pigeon Island	October-November	Lake trout.
Old Forge	November	Whitefish.
Sodus Point	November-December	Lake herring.
South Bay	do	Whitefish.
Stony Island	November	Lake trout.
Three Mile Bay	November-December	Lake herring and whitefish.
Upper Saranac	November	Whitefish.
Ohio:		
Middle Bass	November, December, and April.	Whitefish and pike perch.
North Bass	do	Do.
Port Clinton	do	Do.
Toledo	do	Do.
Rhode Island: Wickford	February-April	Flounder.
Vermont:		
Darling Pond	July-December	Brook trout.
Lake Mitchell	September-December	Do.
Wyoming:		
Clear Creek	July and June	Blackspotted trout.
Columbine Creek	do	Do.
Cub Creek	do	Do.
Lake Camp	do	Do.
Pelican Creek	do	Do.

DISTRIBUTION OF FISH AND EGGS, BY STATES, WATERS, AND SPECIES, DURING THE FISCAL YEAR 1917.

On the pages following are shown in detail the distribution of fish eggs, fry, fingerlings, yearlings, and adults, by species, by States and municipalities, alphabetically arranged, and by waters, for the fiscal year ended June 30, 1917.

The distribution was composed largely of fingerlings, yearlings, and adults, though quite a number of eggs and fry of some species were distributed. In succeeding pages where figures are preceded by an asterisk (*) such numbers indicate an egg distribution; if preceded by a dagger (†), a fry distribution. All other enumerations represent fingerlings, yearlings, and adults.

Distribution of fish and eggs, fiscal year 1917.

CATFISH.

Disposition.	Number.
Alabama:	
Abbeville, Davis Mill Pond	50
Birmingham, City Lake	40
Dancy, Solesbury Lake	200
Goodwater, Newman's pond	100
Headland, Blackwood Creek	80
Blue Pond	100
Brackin's pond	140
Dunham Creek	80
Montgomery, Sandlin's pond	50
Pinckard, York's pond	100
Three Notch, Miller's pond	100
Arizona:	
Douglas, Mulberry Pond	200
Duncan, Cottonwood Pond	200
Flagstaff, Lake Mary	100
Globe, Roosevelt Lake	2,200
Jerome Junction, Chino Creek	100
Skull Valley, Otto Pond	100
Tucson, Soto's pond	400
Arkansas:	
Black Rock, Black River	15,232
Daggett, Cache River	300
Elkins, Mountain Lake	100
Fayetteville, White River	340
White River, West Fork	400
Green Forest, Pine Grove Pond	200
Harrison, Grassy Pond	100
Oak Grove Pond	100
Kerlin, Christie's pond	100
Mammoth Spring, Warm Fork Creek	207
St. Joe, Johnson's pond	40
Womble, Edwards's pond	160
Colorado:	
Cimarron, Swanson Lake	200
Fountain, Eureka Lake	595
Grand Junction, Welsh Pond	495
Hotchkiss, Park Lake	495
Montrose, Frees's pond	200
Georgia:	
Athens, Brooks's pond	200
Atlanta, Coats's pond	40
Bogart, Lee's pond	100
Broxton, Kight's pond	200
McGovern's pond	200
Ricketson's pond	100
Carrollton, Little Tallapoosa River	300
Pittman's pond	100
Crawfordville, Chapman Creek	200
Nuns Pond	25
Douglas, Vickers's pond	200
Elberton, Broad River	400
Fairburn, Reeves's pond	100
Georgia—Continued.	
Fayetteville, Coleman's pond	100
Gay, Gay's pond	20
Williams-Fitzgerald Pond	40
Loganville, Bennett's pond	200
Manchester, Rock Creek	200
Mitchell, Allen's pond	100
Monroe, Alcova River	300
Roberts's pond	200
Snow's pond	200
Piedmont, Bussey Branch	100
Rochelle, Spring Lake	300
Rockmart, Wood-Knight Pond	100
Social Circle, Row's pond	100
White Plains, Freestone Pond	100
Simmons's pond	150
Illinois:	
Apple River, Apple River	750
Carbondale, Borger Lake	200
Carrollton, Greenwood Pond	200
Council Hill, Fever River	600
Crystal Lake, Crystal Lake	2,000
Dallas City, Lake Cooper	32
Farmer City, Salt Creek	200
Galena, Mississippi River	[a] 46,500
Galesburg, City Lake	200
Millington, Fox River	600
Nora, Apple River	1,200
North Hanover, Apple River	2,000
Rodden, Apple River	2,000
Scales Mound, Fever River	600
Stockton, Plum River	2,000
Warren, Apple River	1,350
Indiana:	
Angola, Fox Lake	200
Jackson Lake	200
Edinburgh, Sugar Creek	400
Evansville, Evansmere Pond	1,000
Fruitdale, Hillcrest Pond	200
Jasonville, Stefanski's pond	100
Mishawaka, St. Joseph River	400
Muncie, Gravel Pit Pond	200
Iowa:	
Bellevue, Mississippi River	[a] 344,000
Boone, Des Moines River	600
Fairfield, Fairfield Pond	1,250
Fairport, Mississippi River	[a] 112,952
Lime Springs, Upper Iowa River	3,750
Manchester, Maquoketa River	3,000
North McGregor, Mississippi River	[a] 531,200
Kansas:	
Langdon, Sunnybrook Pond	150
Osage City, Smith's pond	100

[a] Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1917—Continued.

CATFISH—Continued.

Disposition.	Number.
Kansas—Continued.	
Satanta, Irrigation Pond	100
Sharon, Sharon Valley Fruit Farm Lake	100
Topeka, Wakarusa River	400
Kentucky:	
Auburn, Fisher's pond	100
Crofton, Railroad Lake	200
Demossville, Licking River	300
Glasgow, Dean's lake	200
Hodgenville, Nolyn Creek	600
Stark's pond	100
Lebanon, Mattingly's pond	100
Richwood, Denfel's pond	100
Sturgis, Lindle's pond	100
Vine Grove, Macey's pond	400
Riley's pond	200
Louisiana:	
Lake Charles, King's pond	200
New Orleans, Aquarium	55
Maryland:	
Bel Air, Reeves Pond	100
Dickerson, Potomac River	125
Frederick, Monocacy River	400
Seneca, Potomac River	150
Massachusetts:	
Clinton, Coachlace Pond	400
East Lake	800
Mossy Pond	400
Waushaccum Lake	800
West Lake	800
Palmer, State Ponds	12,500
Michigan:	
Clinton, Raisin River Pond	200
Wampler Lake	400
Cressey, Crooked Lake	400
Highland, Lakes in Oakland County	3,600
Houghton, O'Neil Lake	525
Iron Mountain, Crystal Mud Lakes	525
Jackson, Portage Lake	400
Pontiac, Mud Lake	200
St. Louis, Pine River	400
Scottville, Pere Marquette River	400
Vanderbilt, Round Lake	400
Minnesota:	
Brimson, Indian Lake	300
Currie, Buffalo Lake	300
Degraff, St. Marys Lake	300
Homer, Mississippi River	[a] 548,040
Lake City, Lake Pepin	[a] 716,772
Richmond, Mississippi River	[a] 25,725
Winona, Mississippi River	[a] 175,900
Mississippi:	
Aberdeen, Cypress Pond	200
Goose Pond	200
House Pond	175
Canton, Farm Lake	300
Ecru, Willow Pond	75
Friars Point, Mississippi River	[a] 3,327
Hazlehurst, Home Lake	300
Kosciusko, Kosciusko Lake	100
West's pond	100
Myrtle, Frazier's pond	100
Pontotoc, Ridgeway Lake	150
Tougaloo, Moman's pond	40
Van Vleet, Neal's pond	150
Woodville, Lake Maurice	40
Missouri:	
Cooks, Meramac River	800
Everton, Oak Leaf Park Pond	400
Faucett, Moore's pond	200
Jaundon, Graves Lake	400
Joplin, Sloan's pond	155
La Belle, Lake Mattingly	300
Merwin, Corbin's pond	400
Neosho, Morse Park Ponds	300
Springfield, Bray's pond	200
Tebbetts, Elley's pond	100
Montana:	
Forsyth, Tongue River	800
Yellowstone River	2,000
New Hampshire:	
Bennington, Gregg Pond	600
Franklin, Pemigewassett River	800
New Mexico:	
Carrizozo, Skow's pond	100
Chamita, Rio Grande	150
Deming, Idyl Wyld Pond	100
Elida, McAlester's pond	50
Mullen's pond	50
Phillips's pond	50
Kenna, Kimo Pond	50
Melrose, Sweet's pond	50
Moriarty, Diamond X Ranch Pond	100
Portales, Dunlap Lake	50
Roswell, Chain Lake	100
Figure Eight Lake	50
Horseshoe Lake	100
South Spring River	50
Sutherland Lake	100
Roy, Chicosa Lake	125
Socorro, Story's pond	50
Torreon Pond	50
Texico, Jones's pond	100
Wagon Mound, Jordan's pond	75
Yeso, Willoughby's pond	50
New York:	
Addison, Canisteo River	800
Avon, Horseshoe Pond	800
Maryland, Schnevus Creek	600
Pine Bush, Dwarkill Creek	400
Shawangunkkill Creek	600
North Carolina:	
Elkland, Miller Pond	125
Fuquay Springs, Spring Water Pond	75
North Dakota: Lisbon, Lone Tree Lake	1,000
Ohio:	
Belleville, Clear Fork Creek	75
Crane Pond	25
Cutrow Pond	50
Gatton Lake	25
Plank Pond	25
Berea, Kinney Pond	400
Cincinnati, Lake Como	200
Cridersville, Moyer's pond	200
Oneida, Big Sandy Creek	600
Robinson, Robinson Pond	200
St. Marys, Lake St. Marys	50
Oklahoma:	
Aline, Timmons's pond	150
Altus, City Lake	100
Armstrong, Hatchery Ponds	10
Brinkman, Lake George	150
Byars, Hawser Lake	200
Cordell, Barton Pond	150
Chamblee Lake	150
Edwards Lake	150
Davidson, Couch's pond	100
Davis, Freeman Lake	100
Eldorado, Pleasure Pond	100
Erick, Downs Pond	150
Fairview, Pail's pond	150
Frederick, Slack's pond	200
Grandfield, Hancock's lake	100
Huff's pond	100
Parks's pond	100
Hobart, Bredel's pond	100
Lakeview Pond	100
Lenon's pond	200
Portwood's pond	200
Tobin's pond	150
Jet, Matthews West Lake	150
Twin Lakes	150
Lawton, Highland Lake	100
Lookeba, Willow Lake	100

[a] Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1917—Continued.

CATFISH—Continued.

Disposition.	Number.
Oklahoma—Continued.	
Mill Creek, Westheimer-Daube Pond	350
Ringwood, Unruh's pond	100
Sulphur, Orchard Hill Pond	150
Texhoma, Allison's pond	550
Texola, Brushy Creek	150
Graves's pond	150
Whorton's pond	150
Thomas, Little Deer Pond	150
Walter, Kennedy's pond	100
Watova, Munson's ponds	100
Wynnewood, Husted's pond	100
Pennsylvania:	
Arcola, Perkiomen Creek	170
Cassandra, Noels Creek	300
Cherry Tree, Meadow Spring Pond	300
Coalport, Beaverdam Run	600
Collegeville, Perkiomen Creek	170
Curry, Keagy Pond	300
Denver, Gross Pond	340
Hefts Pond	340
East Greenville, Perkiomen Creek	170
Espyville, Spring Run Pond	50
Frankstown, Juniata River	600
Gardners Station, Bermudian Creek	300
Latimore Creek	200
Gratersford, Perkiomen Creek	170
Green Lane, Perkiomen Creek	170
Hanover, Conewago Creek	200
Hendricks, Perkiomen Creek	170
Indiana, Moose's pond	600
Johnstown, Wildcat Pond	500
Wilmore Pond	500
Kratz, Perkiomen Creek	170
Lancaster, Sheetz's pond	500
Langhorne, Beechwood Pond	20
Gross's pond	250
Lititz, Hammer Creek	170
Rhudy Run	170
Zartman Pond	340
McLean, Perkiomen Creek	170
Mackeyville, Dumm's pond	100
Manheim, Chickies Lake	680
Oaks, Perkiomen Creek	170
Pennsburg, Perkiomen Creek	170
Pequea, Susquehanna River	850
Perkiomenville, Perkiomen Creek	170
Philadelphia, League Island Pond	100
Phoenixville, French Creek	510
Quakertown, Sheard Lake	250
Rahns, Perkiomen Creek	170
Red Hill, Perkiomen Creek	170
Rushland, Neshaminy Creek	550
Salford, Perkiomen Creek	170
Salisbury Junction, Sullivan Pond	300
Schwenksville, Perkiomen Creek	170
Scranton, Moosic Lake	200
Somerfield, Marleys Run	300
Souderton, Perkiomen Creek, East Branch	680
Spring Mount, Perkiomen Creek	170
Stewartstown, Anderson's pond	100
Warrier Ridge, Juniata River	600
White Ridge, Juniata River, Frankstown Branch	300
Wilkes-Barre, Thorn Lake	350
Yerkes, Perkiomen Creek	170
Zieglersville, Perkiomen Creek	170
South Carolina:	
Lowrysville, Robbins's pond (A)	100
Robbins's pond (B)	100
Robbins's pond (C)	100
Turkey Creek	200
Lykesland, Gantt's pond	150
South Carolina—Continued.	
Orangeburg, Indogo Run	200
Sally, Cooper's pond	75
Sawyer's pond	75
South Dakota:	
Bellefourche, Westcott's pond	75
Canton, Sioux River	200
Fairburn, Fay's pond	75
Lake Andes, Lake Andes	1,400
Madison, Lake Madison	1,400
Pukwana, Red Lake	1,400
Tennessee:	
Bear Creek Junction, Mining Company Ponds	70
Bethel Springs, Moore's pond	100
Calhoun, Swofford's pond	70
Cookeville, Caruthers's pond	70
Denmark, Hardee's pond	100
Dyer, Reed's pond	50
Estill Springs, Elk River	200
Gleason, Brummitt's pond	50
McKenzie, Sexton's pond	60
McMinnville, Horton's pond	100
Maryville, Boring's pond	100
Murphreesboro, Baskin's pond	85
Blue Pond	100
Cedar Lake	100
Hoover's pond	75
Nashville, Messenger's pond	200
Ooltewah, Haven's pond	70
Quebeck, Davis's pond	70
Rutherford, Good Luck Pond	100
Springfield, Carr Creek	340
Tullahoma, East Mulberry Creek	450
Vermont: Lyndonville, State fish commission	100
Virginia: Cullen, Robertson's pond	90
West Virginia:	
Belington, Viquesney Pond	150
Elkins, Tygarts Valley River	600
Harrisville, Hughes River, North Fork	300
Kerens, Leading Creek	600
Keyser, Cabin Run	450
Powell, Lost Run	600
Weston, West Fork River	300
Wisconsin:	
Eagle River, Eagle Chain of Lakes	6,000
Fall Creek, Fall Creek	600
Fountain City, Mississippi River	a 646,020
Genoa, Mississippi River	a 230,000
La Crosse, Mississippi River	a 370,000
Ladysmith, Park Lake	300
Lynxville, Mississippi River	a 200,000
Mazomonia, Mill Pond	1,200
Monroe, Hyde Pond	1,200
Monticello, Little Sugar Creek, West Branch	900
Sugar River, branch of	900
Nashville, Dry Lake	800
Rice Lake, Berger Lake	300
Desair Lake	300
Hinrich Lake	300
Lake Montanis	300
Lower Rice Lake	400
Moon Lake	300
Spruce Lake	300
Tuscobia Lake	400
Trempealeau, Mississippi River	a 154,467
Canal Zone: Ancon, Panama Canal	1,000
Total	b 4,251,239

a Rescued from overflowed lands and restored to original waters.
b Lost in transit, 3,955.

Distribution of fish and eggs, fiscal year 1917—Continued.

CARP.

Disposition.	Number.	Disposition.	Number.
Arkansas: Black Rock, Black River	6	Mississippi: Friars Point, Mississippi River	1,847
Illinois:		Tennessee: Erwin, Bonner's Pond	2,000
Dallas, Lake Cooper	449	Wisconsin:	
Galena, Mississippi River	8,800	Fountain City, Mississippi River	95,228
Iowa:		Genoa, Mississippi River	20,000
Bellevue, Mississippi River	33,300	La Crosse, Mississippi River	53,000
Fairport, Mississippi River	†112,000 4,741	Lynxville, Mississippi River	5,000
North McGregor, Mississippi River	26,290	Trempealeau, Mississippi River	171,555
Minnesota:		Total	†112,000 605,407
Homer, Mississippi River	122,850		
Lake City, Lake Pepin	6,921		
Richmond, Mississippi River	23,390		
Winona, Mississippi River	30,030		

BUFFALOFISH.

Arkansas: Black Rock, Black River	123	Minnesota—Continued.	
Illinois:		Richmond, Mississippi River	17,675
Dallas City, Lake Cooper	788	Winona, Mississippi River	450
Galena, Mississippi River	8,000	Mississippi: Friars Point, Mississippi River	3,296
Meredosia, Meredosia Bay	150	Missouri:	
New Boston, Mississippi River	†1,740,000	Ste. Genevieve, Huber's pond	10
Iowa:		Kern's pond	10
Bellevue, Mississippi River	47,400	Wisconsin:	
Fairport, Mississippi River	†3,695,000 2,737	Fountain City, Mississippi River	1,150
Muscatine, Mississippi River	†100,000	Genoa, Mississippi River	5,000
North McGregor, Mississippi River	55,060	La Crosse, Mississippi River	6,500
Port Lawrence, Mississippi River	†619,000	Lynxville, Mississippi River	1,000
Quarry Pond, Mississippi River	†100,000	Trempealeau, Mississippi River	57,450
Sooke Island, Mississippi River	†250,000	Total	†6,754,000 207,898
Turkey Island, Mississippi River	†250,000		
Minnesota:			
Lake City, Lake Pepin	1,099		

SUCKERS.

Arkansas: Black Rock, Black River	186	Minnesota: Lake City, Lake Pepin	462
Maryland: Dickerson, Potomac River	100	Total	748

SHAD.

District of Columbia: Highway Bridge, Potomac River	†600,000	Oregon:	
Maryland:		Astoria, Youngs River	†180,000
Bar Landing, Potomac River	†810,000	Willamette, Willamette River	†2,171,000
Broad Creek, Potomac River	†7,281,000	South Carolina:	
Chapman Point, Potomac River	†1,318,000	Branchville, Edisto River	†125,000
Little Hunting Creek, Potomac River	†1,853,000	Jacksonboro, Edisto River	†145,000
Moxleys Point, Potomac River	†7,151,000	Virginia:	
Piscataway Creek, Potomac River	†8,856,000	Dogue Creek, Potomac River	†8,130,000
Swan Creek, Potomac River	†7,789,000	Mount Vernon, Potomac River	†2,115,000
North Carolina:		Occoquan Creek, Potomac River	†10,315,000
Edenton, Albemarle Sound	†5,762,000	Pamunkey Creek, Potomac River	†5,090,000
Edenton Bay	†298,000	Pohick Creek, Potomac River	†7,957,000
		Total	†77,946,000

RIVER HERRING.

Disposition.	Number.
Illinois: Galena, Mississippi River	177,000

Distribution of fish and eggs, fiscal year 1917—Continued.

WHITEFISH.

Disposition.	Number.
Illinois:	
Chicago, Applicant	*200,000
Spring Grove, State fish commission	*5,000,000
Michigan:	
Alpena, Lake Beaver	†250,000
Belle Isle, Detroit River	†20,200,000
Lake St. Clair	†10,000,000
Carsonville, Lake Huron	†1,200,000
Cathead Reef, Lake Michigan	†6,000,000
Crystal Falls, Anderson Lake	†100,000
Fortune Lake, North	†200,000
Fortune Lake, South	†200,000
Fort Wayne, Detroit River	†5,000,000
Iron River, Chicagon Lake	†300,000
Manistee, Lake Michigan	†1,200,000
Manistique, Lake Michigan	†1,680,000
Manitou Island, Lake Michigan	†6,000,000
Marquette, Lake Superior	†3,780,000
Naubinway, Lake Michigan	†2,880,000
New Richmond, Lake Michigan	†1,200,000
Northpoint Reef, Lake Huron	†8,000,000
Old Mission Point, Traverse Bay	†6,000,000
Point Patterson, Lake Michigan	†720,000
Point Soul Choix, Lake Michigan	†720,000
Presque Isle, Grand Lake	†300,000
Lake Esau	†250,000
St. Joseph, Lake Michigan	†1,200,000
Sand Bay, Lake Michigan	†6,000,000
Scarecrow Island, Lake Huron	†12,000,000
Susie Island, Lake Superior	†1,275,000
Thunder Bay, Lake Huron	†5,000,000
Minnesota:	
Grand Portage, Lake Superior	†1,275,000
St. Paul, State fish commission	*122,500
Montana: Somers, State fish commission	*300,000
New York:	
Fox Island, Lake Ontario	†750,000
Grenadier Island, Lake Ontario	†4,850,000
Hayes Point, Lake Ontario	†600,000
Long Lake West, Little Tupper Lake	*500,000
New York, Aquarium	*500,000
Niagara Falls, Lake Ontario	†1,000,000
Plattsburg, Lake Champlain	†2,000,000
Pleasant Lake, Pleasant Lake	†500,000
Point Peninsula, Lake Ontario	†2,750,000
Port Henry, Lake Champlain	†1,000,000
Rouses Point, Lake Champlain	†2,000,000
Three Mile Bay, Lake Ontario	†500,000
Watkins, Seneca Lake	†630,000
Wilson, Lake Ontario	†3,600,000
Ohio:	
Catawba Island, Lake Erie	†10,000,000
Isle St. George, Lake Erie	†40,000,000
Kellys Island, Lake Erie	†35,000,000
Marblehead, Lake Erie	†20,000,000
Middle Bass, Lake Erie	†30,000,000
Port Clinton, Lake Erie	†13,500,000
Put in Bay, Lake Erie	†35,000,000
State fish commission	*40,980,000
Sandusky, Lake Erie	†10,000,000
Toledo, Lake Erie	†15,000,000
Wisconsin: Sheboygan, State fish commission	*5,000,000
Total	*52,602,500 †331,610,000

LAKE HERRING (CISCO).

Disposition.	Number.
New York:	
Fox Island, Lake Ontario	†10,925,000
Grenadier Island, Lake Ontario	†16,600,000
Hardscrabble, Lake Ontario	† 6,600,000
Hayes Point, Lake Ontario	† 2,500,000
Henderson Harbor, Lake Ontario	† 2,500,000
Point Peninsula, Lake Ontario	† 2,425,000
Sodus Point, Lake Ontario	† 7,500,000
New York—Continued.	
Three Mile Bay, Lake Ontario	†10,500,000
Tibbetts Point, Lake Ontario	† 4,000,000
Trout Hole, Lake Ontario	† 7,000,000
Wilson Bay, Lake Ontario	†12,000,000
Total	82,550,000

SILVER SALMON.

Disposition.	Number.
California; Hornbrook, Klamath River	†50,000 11,000
Oregon:	
Applegate, Applegate Creek	†393,700
Clackamas, Clackamas River	4,400
Trail, Rogue River	6,000
Troutdale, Big Sandy River	10,000
Upper Clackamas, Clackamas River	71,700
Washington:	
Baker Lake, Baker Lake	508,900
Birdsview, Grandy Creek	1,980,000
Brinnon, Wolcotts Slough	†197,400
Darrington, Hatchery Creek	†700,000
Washington—Continued.	
Duckabush, Docewallips River	1,487,980
Duckabush River	†38,000 335,980
Illabott, Illabott Creek	†259,600
Quilcene, Big Quilcene River	137,000
Little Quilcene River	110,000
Quinault, Quinault Lake	†1,910,000
Sultan, Elwell Creek	†340,000
Skyomish River	†515,000
Total	†4,403,700 4,662,960

CHINOOK SALMON.

Disposition.	Number.
California:	
Baird, McCloud River	3,702,000
Battle Creek, Battle Creek	5,695,300
Hornbrook, Klamath River	†700,000 368,000
Klamathon, Klamath River	†100,000
Mill Creek, Mill Creek	4,863,000
Sisson, State fish commission	*7,027,300
Kentucky: Lexington, Russell Cave Spring Lake	6,000
Oregon:	
Applegate, Applegate Creek	†171,500
Clackamas, Clackamas River	3,592,100
Hatchery Creek	200,000
Johnson Creek	200,000
Portland, State fish commission	*163,900

Distribution of fish and eggs, fiscal year 1917—Continued.

CHINOOK SALMON—Continued.

Disposition.	Number.
Oregon—Continued.	
Seuferts, Fifteen Mile Creek	60,000
Trail, Rogue River	1,758,800
Upper Clackamas, Clackamas River	†463,000 755,200
Washington:	
Baker Lake, Baker Lake	†85,581
Big White Salmon, Big White Salmon River	†2,437,958 387,290
Spring Creek	†1,873,000 180,000
Washington—Continued.	
Duckabush, Docewallips River	689,550
Duckabush River	16,957
Illabott, Illabott Creek	44,105
Little White Salmon, Little White Salmon River	†10,413,365 4,547,279
Quinault, Quinault Lake	†160,000
Total	*7,191,200 †16,404,404 27,065,581

BLUEBACK SALMON.

Disposition.	Number.
Alaska:	
Afognak, Hatchery Creek	†7,506,000
Lake Creeks	†2,300,000
Letnik Lake	†3,770,700 2,200,000
Yes Bay, Hatchery Creek	†9,000,000
Lake McDonald	†21,200,000 1,448,000
Yes River	†19,400,000
Oregon: Bonneville, State fish commission	*2,000,000
Washington:	
Baker Lake, Baker Lake	†711,825 1,996,000
Birdsview, Grandy Creek	60,000
Grandy Lake	37,000
Quinault, Quinault Lake	†11,150,000 52,953
Total	*2,000,000 †75,038,525 5,793,953

HUMPBACK SALMON.

Disposition.	Number.
Alaska:	
Afognak, Hatchery Creek	†5,795,000
Letnik River	†13,548,000
Maine:	
Calais, St. Croix River	†925,050
Cherryfield, Narraguagus River	†525,000
Dennysville, Dennys River	†1,050,000
East Machias, East Machias River	†1,050,000
Orland, Orland River	†1,470,600
Orono, Penobscot River	†1,984,339
South Penobscot, Wights Pond	†506,500
Warren, St. Georges River	†386,715
Washington:	
Birdsview, Grandy Creek	†165,000 3,563,810
Duckabush, Duckabush River	1,960,120
Quilcene, Big Quilcene River	1,700,100
Little Quilcene River	225,000
Total [a]	†27,406,204 7,449,030

CHUM SALMON.

Disposition.	Number.
Washington:	
Birdsview, Grandy Creek	928,010
Brinnon, Wolcotts Slough	†892,800
Darrington, Bennetts Slough	†277,000
Duckabush, Duckabush River	†2,402,000 5,838,520
Illabott, Illabott Creek	†1,831,000
Little White Salmon, Little White Salmon River.	†1,447,500 248,050
Washington—Continued.	
Quilcene, Big Quilcene River	†6,528,000
Little Quilcene River	†1,025,000
Total	†14,403,300 7,014,580

STEELHEAD.

Disposition.	Number.
Maine: Forest, Farrar Lake	†27,200
Massachusetts: Duxbury, Applicant	*200,000
Michigan:	
Bessemer, Spring Creek	2,000
Crystal Falls, Holmes Lake	4,000
Paint River	4,000
Ewen, Ontonagon River	4,000
Ishpeming, Cedar Lake	2,000
Skandia, Foster Creek	1,500
Watersmeet, Trout Creek	4,000
Minnesota:	
Brimson, Mollie Lake	6,000
Central Lakes, Crystal Lake	5,000
Chisago City, Green Lake	10,000
Minnesota—Continued.	
Clearbrook, Deep Lake	4,000
Steenerson Lake	4,000
St. Paul, State fish commission	*200,000
Tamarack, Sandy Lakes	10,000
Montana: Forest Grove, Snider's pond.	3,000
New Hampshire: Conicut, Lake Tarleton	5,500
New Jersey: Hackettstown, State fish commission	*100,000
New York:	
Caledonia, State fish commission	*300,000
Dunraven, State fish commission	*200,000
North Creek, Thirteenth Lake	1,500

[a] Loss in transit, 13,335 fry.

Distribution of fish and eggs, fiscal year 1917—Continued.

STEELHEAD—Continued.

Disposition.	Number.
New York—Continued.	
Oakdale, Great River	*100,000
Raquette Lake, Lake Kamso	*25,000
Stamford, Beaver Creek	1,500
Tuxedo, Tuxedo Lake	*25,000
North Dakota: St. John, State fish commission	*100,000
Oregon:	
Applegate, Applegate Creek	†34,500
Bonneville, State fish commission	*1,037,600
Butte Falls, State fish commission	*650,000
Clackamas, Clackamas River	286,500
Milk Creek	10,000
Estacada, Clackamas River	40,750
Mountain Lake, Clackamas River, South Fork	1,600
Trail, Rogue River	128,600
Vermont:	
Brattleboro, West River	2,500
Groton, Wells River	680
Holden, Chittenden Pond	7,000
Orleans, Willoughby River	3,700
Pawlet, Metowee River	1,250
Roxbury, State fish commission	*200,000
Rutland, Button Brook	2,000
Emerald Lake	1,259
Scott Brook	2,000
Sunset Lake	1,250
St. Johnsbury, Joes Pond	1,000
Moose River	1,000
Sleepers River	3,000
South Royalton, White River, branch of	6,000
South Ryegate, Round Pond	2,000
Waterbury, Waterbury River	6,120
Washington:	
Aberdeen, East Wishkah River	6,000
Newskah River	6,000
Washington—Continued.	
North River	8,000
Summit Lake	6,000
West Wishkah River	8,000
Baker Lake, Baker Lake	†66,510
Bellingham, Lake Louise	5,000
Birdsview, Day Creek	15,000
Grandy Creek	1,075,000
Mill Creek	45,000
Phinney Creek	45,000
Skagit River	198,000
Brinnon, Docewallips River	†235,000
Little Beef Creek	†7,800
Chewelah, Deer Lake	3,500
Duckabush, Duckabush River	†689,700
Kelso, Ostrander Creek, South Fork	3,000
Northport, Deep Lake	3,500
Quilcene, Big Quilcene River	†476,500
Little Quilcene River	†150,000
Sand Creek, Sand Creek	4,000
Sultan, Elwell Creek	†353,500
Wisconsin:	
Cable, Williams Lake	4,000
Grand View, Aitkins Lake	4,000
Muscalonge Lake	4,000
Taylor Lake	4,000
Upper Clam Lake	6,000
Salmo, Raspberry Creek	4,000
Sioux River	5,000
Waupaca, Little Wolf River, South Branch	10,000
Wyoming:	
Laramie, State fish commission	*100,000
North Platte, North Platte River	9,500
Total [a]	*3,237,600 †2,040,710 2,061,709

RAINBOW TROUT.

Disposition.	Number.
Alabama: Chandler Springs, Chandler Springs Creek	600
Arkansas:	
Harrison, Mill Creek	2,500
Lewisville, Dobson's pond	172
California:	
Baird, McCloud River	14,450
Hornbrook, Klamath River	†11,200
Point Reyes, Lime Gulch Creek	†25,000
Colorado:	
Almont, East River	1,500
Antero, Antero Reservoir	52,500
Austin, Surface Creek, West Fork	1,000
Bowie, Hubbard Creek	2,000
Castles, Taylor Creek	2,000
Debeque, Leon Creek	2,000
Mesa Lake	5,000
Delta, Surface Creek	4,000
Durango, Conejos River	1,500
Potato Lake	1,500
Estes Park, Big Thompson River, South Fork	15,000
Florissant, Crystal Peak Pond	500
Fraser, Little St. Louis Creek	500
Granby, Beaver Lake	2,000
Grand Lake	2,000
Hillside, Angico Pond	2,500
Leadville, Lower Evergreen Lake	6,000
Loveland, Big Thompson River	11,000
Big Thompson River, North Fork	19,000
Big Thompson River, South Fork	21,000
Platte River, Millers Fork	8,000
Matterhorn, Priest Lakes, Lutz's pond	1,000
Moffat, Lutz's pond	500
Colorado—Continued.	
Norrie, Deeds Creek	2,000
Ophir, Howard Fork Lake	1,000
Ouray, Blue Lake	1,500
Lake Lenore	1,000
Parshall, Keyser Creek	2,000
Rifle, White River	2,000
White River, South Fork	1,500
Rosemont, Abbott's pond	500
Ruedi, Ford and Henderson Lake	4,000
Frying Pan River	4,000
Ruedi Creek	2,000
Ruedi Lake	4,000
Smith Creek	2,000
Salida, Cochetopa Creek	1,000
South Arkansas River	1,500
Sapinero, Gunnison River	1,500
Sellar, Cunningham Creek	1,000
Sloss, Frying Pan River	4,000
Rocky Fork Creek	2,000
Steamboat Springs, Walton Creek Pond	500
Vasquez, Little Vasquez Creek	500
Walden, Michigan River	10,000
North Platte River	10,000
Weston, Russell Lake	6,000
Connecticut: Taconic, Ward Brook	1,007
Georgia:	
Asbestos, Merritt Creek	2,000
Blue Ridge, Big Rock Creek	1,600
Big Skeenah Creek	1,600
Cooper Creek	1,200
Fightingtown Creek	800
Noontootla Creek	1,600
Toccoa River	1,200

[a] Lost in transit, 3,500 fingerlings.

Distribution of fish and eggs, fiscal year 1917—Continued.

RAINBOW TROUT—Continued.

Disposition.	Number.
Georgia—Continued.	
Cartersville, Allatoona Creek	1,200
Raccoon Creek	800
Stamp Creek	1,200
Cleveland, Cathy Creek	6,000
Colley Creek	5,000
Shoal Creek	4,000
Helen, Mitchells Lake	1,000
Hiawassee, Swallow Creek	6,000
Robertstown, Briar Creek	2,000
Fodder Creek	5,000
Soapstone Creek	5,000
Tiger, Hitower Creek	3,000
Idaho:	
Albany Falls, Vane Lakes	1,600
Bellevue, Spring Creek	5,000
Boise, Big Spring Creek	7,500
Blackfoot River	15,000
Buffalo Creek	10,000
Lost River	18,750
Wood River	18,750
Lakeport, Payette River	20,000
Spirit Lake, Spirit Lake	12,800
Illinois:	
Cary Station, Highland Creek	1,000
Chicago, Applicant	*2,000
Spring Grove, State fish commission	*50,000
Indiana: Warsaw, McKrill's pond	3,000
Iowa:	
Cedar Rapids, Coe College	*2,000
Harts Ranch Siding, Little Paint Creek	1,000
Paint Creek	2,000
Jackson Junction, Goddard Creek	2,000
Manchester, Head of Spring Branch	1,500
Monona, Willow Lake	1,000
North McGregor, Bloody Run	2,000
Douseman, Coulee Creek	2,500
Sioux City, Spring Valley Creek	1,000
Waterville, Paint Creek	2,500
Kentucky:	
Dione, Kentucky River, Poor Fork	1,560
Gatun, Kentucky River, Clover Fork	1,650
Harlan, Kentucky River, Martin Fork	1,650
Jeffersontown, Osterholt's pond	1,000
Livingston, Sinking Creek	660
Nubert, Kentucky River, Clover Fork	1,330
Pineville, Kentucky River, Clear Fork	1,650
Rhea, Kentucky River, Poor Fork	1,500
Maine:	
Farmington, Clearwater Lake	4,000
Portland, Crooked River	4,000
Maryland:	
Baltimore, Applicant	*6,800
Deer Park, Altamont Lake	600
Frostburg, School House Run	300
Hagerstown, City Park Lake	2,000
Oakland, Cherry Creek	300
Deep Creek	300
Dunkard Lick Run	300
Massachusetts:	
Athol, Swift River, East Branch	3,000
Leominster, Wickeepickee Vrook	3,000
Lowell, Burgess Pond	2,000
Forge Pond	3,000
Long Pond	3,000
Long-Sought-For Pond	2,000
Spectacle Pond	3,000
Michigan:	
Branch, Pere Marquette River	6,000
Metamore, Brandts Creek	†6,000
Montrose, Glenn Lake	†3,000
Mount Pleasant, Chippewa River	†6,000
Owosso, Applicant	*180,000
Maple River Branch	†3,000
Wingleton, Pere Marquette River	6,000
Minnesota:	
Caledonia, Badger Creek	500
Crooked Creek	500
East Beaver Creek	500
Irish Creek	500
Minneapolis, Nine Mile Creek	2,500
St. Paul Park, Okoboji Lake	1,000
Winona, Ginthers Creek	600
Stockton Creek	600
Mississippi: Pachuta, Horse Shoe Pond	1,800
Missouri:	
Browns Spring, Spring Creek	300
Cabool, Big Piney River, Upper	250
Exeter, Flat Creek	600
Roaring River	2,600
Fairview, Barber Lake	1,235
Joplin, Jenkins Creek	2,500
Lebanon, Bennett Spring River	91
Ha Ha Tonka Lake	250
Neosho, Hickory Creek	8,090
Newburg, Kaintuck Creek	5,000
Noel, Elk River	4,000
Northview, Pomme de Terre River	300
Turn-bull Creek	300
Pineville, Little Sugar Creek	3,600
Rolla, Little Piney River	9,000
St. James, Meramec Spring Pond	4,125
North Meramec River	150
St. Joseph, State fish commission	*98,400
Steelville, Dry Creek	75
Verona, Spring River	8,000
Wayne, Eden's pond	2,500
Montana:	
Anaconda, State fish commission	†153,000
Arlee, Jocko River	3,750
Valley Creek	3,750
Belgrade, Bull Run	6,000
Cottonwood Creek	8,000
Dry Creek	3,000
East Gallatin River	3,000
Middle Creek	3,000
Pass Creek	3,000
Reese Creek	3,000
Ross Creek	3,000
Sixteen Mile Creek	3,000
Thompson Creek	3,000
West Gallatin River	3,000
Billings, Spring Creek	7,500
Box Elder, Cowan's pond	3,750
Boyd, Red Lodge Creek	6,000
Bozeman, Brackett Creek	2,500
Bridger Creek	2,500
Buck Creek	2,000
Cache Creek	2,000
Cherry Creek	2,000
Fransham Creek	2,000
Lava Lake	25,000
Meadow Creek	2,000
Middle Creek	13,000
Mystic Lake	2,000
North Twin Lake	2,000
O'Dell Creek	2,000
Ole Olson Lake	2,000
Pass Creek	2,000
Pine Creek	2,000
Rocky Creek	2,500
Sage Creek	2,500
Sales Lake	2,500
Sixteen Mile Creek	3,000
South Taylor Creek	2,000
South Twin Lake	2,000
Story Lake	2,000
Taylor Creek	3,000
West Rainbow Lake	2,400
Browning, Arnoux Creek	2,000
Cut Bank Creek, North Fork	4,000
Cut Bank Creek, South Fork	1,000
Elk Creek	2,000
Flat Iron Creek	2,000

Distribution of fish and eggs, fiscal year 1917—Continued.

RAINBOW TROUT—Continued.

Disposition.	Number.
Montana—Continued.	
Browning—Continued.	
Greasewood Creek	2,000
Livermore Creek	2,000
Milk River, Middle Fork	2,000
Milk River, South Fork	2,000
Willow Creek	2,000
Bynum, Farmers Lake	10,000
Cascade, Lake Thirty Five	†4,000
Dell, Basin Creek	12,500
Sage Creek	18,750
Dillon, Best's pond	2,000
Edgar, Pryor Creek	8,000
Forest Grove, Flat Willow Creek, South Fork	2,000
McCartney Creek	2,000
Glacier Park, Gunsight Lake	30,000
Great Falls, Elk Run Creek	†6,000
Hilger, Moccasin Creek	2,000
Lewistown, Casino Creek	3,000
Libby, Parmenter Creek	8,000
Malta, Beaver Creek	3,750
Manhattan, Camp Creek	6,000
Gibson Creek	4,000
Oyler Creek	4,000
Martindale, Trail Creek	4,000
Missoula, Belmont Creek	6,250
Big Blackfoot River	8,750
Clearwater River	12,500
Deer Creek	6,250
Elbow Lake	8,750
Gold Creek	8,750
Lake Inez	6,250
Placid Lake	8,750
Salmon Lake	10,000
Seeley Lake	8,750
Monida, Picnic Springs Pond	3,000
Moccasin, Louse Creek	†14,000
Plains, Kelly Lake	7,500
Red Lodge, Rosebud River	27,000
Stevensville, Bitter Root River, Burnt Fork	†12,000
Kootenai Creek	†8,000
North Burnt Fork Creek	5,000
Smith Slough Creek	2,500
Spring Creek	†4,000
Swamp Creek	†6,000
Sweet Grass, Maverick Lake	5,000
Townsend, Deep Creek	5,000
Whitefish, Beaver Lake	8,000
Whitefish Lake	9,600
Yellowstone, Madison River, South Fork	30,000
Nebraska:	
Kilgore, Spring Creek	2,000
Lakeside, Tyler's pond	3,000
Rushville, American Horse Creek	2,000
Medicine Root Creek	2,000
No Flesh Creek	2,000
Pine Creek	2,000
White Clay Creek	2,000
Nevada:	
Ely, Applicant	*90,000
Verdi, Truckee River and tributaries	†5,000 3,000
New Hampshire:	
Bennington, North Branch River	5,000
Campton, Ellsworth Pond	3,000
Enfield, Cole Pond	3,000
Keene, Ashuelot River	4,000
Meredith, Lake Winnepesaukee	19,000
Newport, Sugar River, North Branch	3,000
Sugar River, South Branch	3,000
Potter Place, Cole Pond	6,000
Warren, State fish commission	*100,000
New Jersey:	
Englewood, East Northvale Brook	400
Hackettstown, State fish commission	*50,000
Whippany, Bagdley Brook	800

Disposition.	Number.
New Mexico:	
Chama, Chama River	1,000
Chamita, Santa Clara Creek	1,000
Clovis, Taylors pond	500
Costilla, Costilla Creek	1,500
Embudo, Penasco Creek	1,000
Glorieta, Stewart Lake	500
Las Vegas, Calf Canyon Run	500
South Fork Gallinas River, branch of	500
Park Spring Lake	500
Rio de La Casa	500
Santa Fe, Tesuque River	1,000
Taos, Ben Hur Lake	500
Wagon Mound, Spring Canon Creek	500
New York:	
Auburn, North Brook	†3,000
Owasco Lake	†6,000
Sennet Brook	†4,000
Benson Mines, Star Lake	†8,000
Twin Lakes	†5,000
Forestport, Little Woodhull Creek	†8,000
Gouverneur, Silvia Lake	†4,000
Great Bend, Black Creek	†8,000
Hornell, Canacadea Creek	†8,000
Canisteo Creek	†3,000
Lafargeville, Catfish Creek	†4,000
Newton Falls, Grasse River	†8,000
New York City, Aquarium	*5,000
Port Jervis, Shinglekill Creek	†6,000
Syracuse, Butternut Creek	†8,000
Limestone Creek	†4,000
Nine Mile Creek	†4,000
North Carolina:	
Black Mountain, Long Branch	4,000
Swannanoa River, North Fork	10,000
Swannanoa River, Sugar Fork	4,000
Bowie, Pine Swamp Creek	3,000
Brevard, Kings Creek	5,000
Cherryfield, Cherryfield Creek	5,000
Darby, Buffalo Creek, Joes Fork	2,100
Dugger Creek	2,100
Laurel Creek	1,400
Laurel Creek, Flannery Fork	2,100
Little Dugger Creek	1,400
Pegs Branch	1,400
Rock House Creek	1,400
Upper Buffalo Creek	2,800
Upper Elk Creek	2,800
Yadkin River, Upper Stony Fork	2,100
Denny, Bobs Branch	1,400
Doughton, Sandy Creek	1,400
Elkin, Flat Creek	2,100
Mitchells River, South Fork	2,800
Wood Creek	2,100
Elkland, Elk Creek	2,000
Little Elk Creek	2,000
New River	5,000
Elkville, Ready Branch	1,400
Forney, Forney Creek	12,000
Hendersonville, Hickory Creek	1,400
Mill Creek	1,400
Punchan Camp Creek	1,400
Hickory, Mountain Creek	1,400
Highlands, Adams pond	2,000
Hot Springs, Little Creek	4,000
Huntdale, Big Creek	700
Linville, Linville River	58,000
Watauga River	16,000
McNeil, Masters Branch	1,400
Vanda Creek	1,400
Marion, Buck Creek	15,000
South Toe River	10,000
Marley Ford, Yadkin River, South Lewis Fork	2,100
Yadkin River, Stony Fork	2,800
Montezuma, Chestnut Heights Lake	3,000
Mortimer, Crooked Creek	2,100
Newland, Kentucky Creek	6,000
Toe River	10,000

Distribution of fish and eggs, fiscal year 1917—Continued.

RAINBOW TROUT—Continued.

Disposition.	Number.
North Carolina—Continued.	
Noland, Noland Creek	8,000
North Wilkesboro, Halls Creek	2,100
Mulberry Creek	1,400
Old Fort, Catawba River, North Fork	750
Pineola, Linville River	1,040
Upper Creek	1,875
Pisgah Forest, Davidson River and tributaries	8,000
Selica, Cathey Creek	6,000
Sevier, Crab Tree Creek	10,000
Shulls Mills, Watauga River	28,000
Thurmond, White Oak Creek	2,800
Royal City Creek	1,400
Tuxedo, Green River	2,100
Rock Creek	1,400
Ohio:	
Bellefontaine, Mad River, Headwaters	†6,000
Rush Creek	†6,000
Oklahoma:	
Ada, Byrds Mill Creek	300
Crescent, Kellys Lake	100
Oregon:	
Lakeside, Eel Lake	5,000
Ten Mile Lake	5,000
Pennsylvania:	
Altoona, Canoe Run	15,000
Piney Creek	21,600
Sinking Run	19,600
Vanscoycer Run	15,000
Aspinwall, Hickory Spring Lake	1,400
Bellwood, Bells Gap Creek	1,800
Logan Spring Lake	1,200
Sandy Run	1,800
Tipton Run	1,800
Bridgeport, Crow Creek	1,500
Carlisle, School Farm Pond	1,000
Chambersburg, Caledonia Creek	5,500
Falling Spring Run	17,825
Poor House Run	4,250
Sanatarium Lake	425
Clearfield, Albert Run	1,000
Alder Run	1,000
Bald Hill Run	1,000
Barger Run	1,000
Coal Run	1,000
Cold Run	1,000
Cowder Run	1,000
Cyphers Run	1,000
Dixon Run	1,000
Graffins Run	1,000
Green Run	1,000
Gufford Run	1,000
Hoover Run	1,000
Knepp Run	1,000
Krise Run	1,000
Leonard Run	1,000
Little Moravian Creek	1,000
Little Trout Run	1,000
Little Trout Run, left-hand branch	1,000
Livingston Run	1,000
Lost Run	1,000
Moravian Run	1,000
Mosquito Creek	1,000
Pine Hollow Run	1,000
Rock Hollow Run	1,000
Sanders Big Run	1,000
Sanders Run	1,000
Spruce Run	1,000
Still House Run	1,000
Urey Run	1,000
Wolf Run	1,000
Woodland Run	1,000
Zerfoss Run	1,000
Coudersport, Colcord Creek	1,000
Fees Run	1,000
Fenner Branch	1,000
Green Run	1,500
Pennsylvania—Continued.	
Coudersport, Healks Run	1,000
Howland Creek	1,000
Indian Run	1,500
Jones Run	1,500
Leit Run	1,000
Lent Run	1,000
Lent Hollow Run	1,500
Niles Run	1,000
Pattens Run	1,000
Ruse Branch	1,000
Seibert Run	1,000
Sherwood Creek	1,000
Sinking Branch	1,500
Spoore Run	1,000
Stone Run	1,000
Toles Hollow Run	1,000
Williams Run	1,000
Wolf Run	1,000
Doylestown, Mountain Run	2,400
Tinicum Creek	2,400
Dudley, Trough Creek	2,500
East Mahoney, Lakewood Lake	1,000
Easton, Bushkill Creek	4,000
Ebensburg, Davis Creek	1,800
Pryce Creek	1,800
Everett, Oregon Creek	4,200
Fairview, Lent Woods Creek	2,000
Forks, Fishing Creek	2,500
Garden, Trout Creek	1,500
Valley Creek	1,500
Gardner, Gardner Creek	2,250
Hellertown, Saucon Creek	1,500
Hollidaysburg, Cave Run	1,200
Howellville, Valley Creek and branches	6,000
Hughesville, Big Muncy Creek	3,000
Little Muncy Creek	3,000
Muncy Creek	3,000
Johnstown, Alwine Run	1,400
Baker Run	1,400
Beaver Run (A)	1,400
Beaver Run (B)	1,400
Bens Creek	1,400
Bens Creek, North Fork	1,400
Bens Creek, South Fork	1,400
Big Spring Run	1,400
Breast Work Run	1,400
Canfield Run	1,400
Daily Draft Creek	1,400
Dalton Run	1,400
Dalton Run, Left Fork	1,400
Hinckston Run	1,400
Hinckston Run, Right Fork	700
Laurel Run (A)	1,400
Laurel Run (B)	1,400
Laurel Run, Left Fork	1,400
Lick Run	1,400
Linhart Run	1,400
Little Mill Creek (A)	1,400
Little Mill Creek (B)	1,400
Mill Creek (A)	1,400
Mill Creek (B)	1,400
Mill Creek, Left Fork (A)	1,400
Miller Run	1,400
Mishler Run	1,400
O'Connor Run	1,400
Powder Mill Run	1,400
Rachels Run	1,400
Red Run	1,400
Salt Lick Creek	1,400
Salt Lick Creek, Right Fork	700
Shingle Run	1,400
Solomons Run	1,400
Solomons Run, Right Fork	1,400
Sugar Run	1,400
Sugar Run Pond	1,400
Sugar Run Pond, Lower	700
Tub Mill Creek	1,400
Wildcat Run	1,400

Distribution of fish and eggs, fiscal year 1917—Continued.

RAINBOW TROUT—Continued.

Disposition.	Number.
Pennsylvania—Continued.	
King of Prussia, Trout Creek and branches	1,500
Knoxville, King's pond	500
Lititz, Poplar Run, West Branch	2,250
Media, Ridley Creek	2,000
Nanty Glo, Evans Run	1,200
Mary Powell Run	1,200
New Centerville, Crow Creek	1,000
Gulph Creek and branches	2,000
Trout Creek and branches	1,500
Valley Creek and branches	2,500
Newport, Hunters Valley Creek	3,000
Northbrook, Glen Hall Creek	2,100
Oil City, Camp 23 Run	2,000
Paoli Road, Trout Creek and branches	1,500
Valley Creek and branches	4,500
Planebrook, Crook Creek	1,500
Trout Creek and branches	1,500
Pleasant Mount, State fish commission	*50,000
Richland, Bennetch Lake	500
Krumstown Creek	500
Mill Creek	500
Millard Lake	500
Stricklerstown Creek	500
St. Clair, Silver Creek Pond	2,000
Smithfield, Sandy Creek	2,800
Somerfield, Laurel Run	2,800
Strattonville, Zagst's pond	2,000
Tamaqua, Cramers Run	1,000
Toby Run	1,000
Troy, Leonard Creek	3,000
Tryonville, Olson's pond	3,000
Uniontown, Seaton's lake	2,100
Warfordsburg, Green Valley Pond	700
Waynesboro, East Antietam Creek	6,000
Red Run	3,000
West Chester, Valley Creek	3,000
Williamsport, Loyalsock Creek	4,000
Windber, Dark Shade Creek	1,800
South Carolina:	
Mount Croghan, Short's pond	1,000
Pickens, Little Mountain Creek	3,000
Mountain Creek	3,000
Rock Laurel Creek	2,000
Thompson River	3,000
Whitewater River	4,000
Walhalla, Chattooga River, East Branch	4,800
Devils Fork Creek	4,000
Devils Fork Creek, East Branch	3,200
Devils Fork Creek, West Branch	4,000
Indian Camp Creek	4,000
Moody Creek	3,200
Whitewater River	8,000
South Dakota:	
Brennan, Wounded Knee Creek	2,000
Buffalo Gap, Beaver Creek	7,000
Black Tail Run	1,000
Elmore, Spearfish Creek	†2,000
Englewood, Bogus Jum Creek	6,000
Box Elder Creek	4,000
Elk Creek	†2,000
Hay Creek	†1,000
Landis Creek, Southeast Fork	1,000
Peak Creek, South Branch	1,000
South Branch	†1,000
Spearfish Creek, South Branch	1,000
Upper Lake	†1,000
Fairburn, Dry Creek	1,000
French Creek	2,000
Hill City, Spring Creek	4,000
Hot Springs, Cascade Creek	2,000
Wind Cave Creek	1,000
Maple River, Maple River	2,000
Midland, Standaford's pond	1,000
Mitchell, Enemy Creek	3,000
South Dakota—Continued.	
Mystic, Castle Creek	2,000
Nahant, Hop Creek	1,000
Little Rapid Creek	1,000
Middle Box Elder Creek	2,000
Nigger Creek	1,000
Rapid Creek	1,000
Rapid Creek, North Branch	1,000
Newell, Phillips's pond	2,000
Piedmont, Big Elk Creek	3,000
Rapid City, Barker s pond	†1,000
Boegel Pond	2,000
Mahoney's pond	†1,000
Minnelusa Creek	1,000
Rapid Creek	†1,000
Rochford, Castle Creek	1,000
Riley Pond	1,000
Savoy, Breakneck Gulch Run	†3,000
Little Spearfish Creek	†8,000
Spearfish Creek	†4,000
Spearfish, Boyden Spring Branch	†1,000
Crow Creek, Upper Branch	†1,000
Hulls Creek	†1,000
La Plant Creek	†1,000
Nicholls's pond	†1,000
Nicholls Spring Branch	1,000
Niva's pond	1,000
Pierce Lake	†1,000
Ranch Creek	†1,000
Redwater Power Canal	†1,000
Robinson Lake	1,000
Sand Creek	3,000
Schmidt Creek	†1,000
Spearfish Creek	†5,000
Spring Branch	†1,000
Swamp Creek	†1,000
Sturgis, Bear Butte Creek	†2,000
Spring Creek	1,000
Tilford, Morse Pond	1,000
Tennessee:	
Browns, Laurel Creek	1,600
Chattanooga, Rainbow Lake	500
Stanley Creek	725
Elkmont, Bear Wallow Creek	1,600
Jakes Creek	5,600
Little River	4,400
Little River, East Prong	3,000
Little River, West Prong	2,000
Pigeon River	2,000
Erwin, North Indian Creek	612
Spring Branch	2,425
Farner, Coker Creek	800
Huntland, Reynolds Lake	600
Johnson City, Sinking Creek	1,400
Jonesboro, Broyles Creek	2,000
McFarland, Coca Creek	800
Newport, Sinking Creek	975
Noeton, Holston River	1,600
Probst, Lost Creek	800
Roan Mountain, Heaton Creek	6,000
Shell Creek	10,000
Wonderland Park, Laurel Creek	1,800
Little River	2,000
Utah:	
Provo, Strong's pond	1,000
Salt Lake City, Bowen's pond	500
Byde-A-Wyle Ponds	500
Vermont:	
Marshfield, Winooski River	2,000
Newport, Clyde River	1,000
North Troy, Mississiquoi River	1,000
Virginia:	
Abingdon, White Top Creek	47,000
Alleghany, Dunlaps Creek, Headwaters	3,000
Arcadia, McFalls Creek	3,200
Atkins, Holston River, Middle Fork	8,000
Nicks Creek	2,000

Distribution of fish and eggs, fiscal year 1917—Continued.

RAINBOW TROUT—Continued.

Disposition.	Number.
Virginia—Continued.	
Bedford, Otter River, Hales Fork	2,400
Otter River, North Fork	1,200
Betty Baker, Burks Fork Creek	4,800
Blacksburg, Mill Creek	1,800
Blue Ridge, Clark's pond	600
Buchanan, Stoney Run	3,200
Catawba, Catawba Creek	2,400
Catawba Creek, North Branch	2,000
Christiansburg, Elliots Creek	2,000
Lawrence Pond	800
Stony Creek	800
Struples Creek	1,200
Wilson Creek	1,200
Damascus, Beaverdam Creek	10,000
Birch Branch	2,000
Tennessee Laurel Creek	10,000
White Top Laurel Creek	10,000
Delvale, Powells River, North Fork	4,200
Dolphin, Abernathy's pond	600
Dryden, Ridge View Pond	2,000
East Radford, Conley Creek	1,200
Meadow Creek	1,800
Ellett, Lester Creek	1,800
Fairwood, Fox Creek	3,000
Wilson Creek	1,500
Fagg, Big Trap Run	1,800
Keney Run	1,200
Fries Junction, Brushy Creek	8,000
Goodview, Jumping Run	3,600
Hardwood, Hayes Creek	1,000
Harriston, Moorman River	3,000
Keezleton, Cub Run	2,000
Mountain Run	3,000
Kimballton, Big Stony Creek	6,000
Lexington, Big Spring Pond	2,100
Lynchburg, Buffalo Creek	1,600
Meadow View, Moore Creek	3,250
Narrows, Mill Creek	2,000
New Castle, Meadow Creek	1,600
Pembroke, Little Stoney Creek	3,000
Pulaski, Thorn Pond	1,200
Purcelle, Jones Creek	3,000
Powells River, North Fork	4,000
Richmond, Blithewood Pond	600
Roanoke, Meadow Creek	1,200
Smith Creek	1,000
Rural Retreat, Cripple Creek	4,000
Shawsville, Anderson Run	1,050
Vaughan Creek	6,000
White House Creek	600
Shenandoah, Cub Run	6,000
Snowden, Dancing Creek	2,800
Otter Creek	2,800
Staunton, Mill Creek	2,000
Stephenson, Turkey Run	1,050
Sylvatus, Green Creek	1,400
Laurel Fork Creek	2,800
Tazewell, Beaver's pond	500
Wolf Creek	6,000
Troutdale, Fox Creek	5,000
Guffey Creek	4,000
Vienna, Difficult Creek	†8,000
Whitethorn, Poverty Creek	1,800
Wytheville, Rosenbaum's pond	1,000
Tates Run	295
Washington:	
Chewelah, Waitts Lake	4,800
Colville, Applicant	*50,000
Everett, Applicant	*50,000
Sumner, Glen Acorn Pond	10,000
Spokane, Glen Tana Pond	2,400
Spokane River	*100,000
Tacoma, Falls Creek	2,500
Tonasket, Loots Couleo Creek	*100,000
Vancouver, Battle Ground Lake	5,000
Lewis River, East Fork	10,000
Rock Creek	*50,000
	5,000
West Virginia:	
Alexander, Bear Camp Run	600
Buckhannon River	1,200
Buckhannon River, Middle Fork	600
Elk River, North Fork	600
Lick Run	300
Bowden, Cheat River, Shavers Fork	1,200
Caldwell, Monroe Draft Creek	5,000
Clover Lick, Clover Creek	1,200
Dobbin, Stony River Lake	875
Edinburg, Trout Run	3,000
Elkins, Tygarts Valley River	1,000
Glady, Cheat River, Glady Fork	2,100
Green Spring, Jenkins Pond	100
Harman, Big Run	900
Briery Run	600
Dice Run	900
Laurel Run	1,200
Keyser, Mill Run	600
Martinsburg, Tuscarora Creek	1,200
Midvale, Long Run	16,625
Parkersburg, Bailey's pond	300
Raleigh, Glade Creek	800
Richwood, Cherry River, South Fork	1,400
Thomas, Blackwater River, North Fork	600
Walkerville, Little Kanawha River	1,200
Wisconsin:	
Aniwa, Carpenter Creek	500
O'Neil Creek	500
Red River	500
Arcadia, American Valley Creek	1,500
Davis Creek	1,500
Glencoe Creek	1,000
Lewis Valley Creek	1,500
North Creek	1,000
Rock Creek	2,500
Smith Creek	1,500
Athelstane, Big Eagle Creek	1,500
Bangor, Johnson Creek	1,000
Birnamwood, Embarras River, and tributaries	1,800
Blair, Trump Cooley Creek	1,500
Bloomer, Duncan Creek	3,000
Blue Mounds, Handels Run	2,000
Ryans Run	1,500
Walnut Hollow Run	2,000
Boscobel, Sanders Creek	2,000
Deer Park, Willow River	2,000
Elkhorn, Whitewater Creek	1,500
Ellis Junction, Hand Saw Creek	1,500
Fairchild, Black Creek	1,000
Beaver Creek	1,000
Flick Creek	500
Hay Creek, East	1,000
Horse Creek	500
Pea Creek	1,000
Pettis Creek	500
Scott Creek	500
Thompson Creek	500
Yahn Creek	500
Fond du Lac, Dotyville Creek	300
Merrytown Creek	300
Silver Spring Creek	300
Upper Sheboygan River	300
Glen Flora, Main Creek, North Fork	2,000
Grand Rapids, Big Four Creek	2,000
Hayward, Namakagan Creek	1,000
Independence, Borst Valley Creek	500
Bruce Valley Creek	500
Chimney Rock Creek	500
Cooks Creek	500
Davis Valley Creek	500
Dubiels Creek	500
Fernright Creek	500
George Lyga Creek	1,000
Grietz Creek	500
Hauge Creek	500
Hawkenson Creek	500

Distribution of fish and eggs, fiscal year 1917—Continued.

RAINBOW TROUT—Continued.

Disposition.	Number.
Wisconsin—Continued	
Independence, Hunts Valley Creek	500
Johnson Creek	500
Kurths Creek	500
Lindon Creek	500
Maloney Creek	500
Marsolch Creek	500
North Branch Creek	500
Olsen Creek	500
Palkowski Creek	500
Plum Creek	500
Popes Creek	500
Roskos Creek	500
Ruste Creek	500
Schaffner Creek	500
Skogstad Creek	500
Traverse Creek	500
Ulberg Creek	500
Ute Creek	500
Veum Creek	500
Zimmer Creek	500
Kilbourn, Hulbert Creek	1,000
La Crosse, Adams Valley Creek	500
Big Creek	1,000
Burham Valley Creek	500
Burns Creek	1,000
Chipmunk Cooley Creek	1,000
Fish Creek	500
Fleming Creek	1,000
Mormon Cooley Creek	1,000
Timber Cooley Creek	1,000
La Forge, Bear Creek	2,000
Manitowac, Devil River	500
Jambo Creek	500
Kriwanek Creek	500
Mishicott River	500
Pigeon River	1,000
Marinette, Menominee River	3,000
Mauston, Seven Mile Creek	500
Norwalk, Moores Creek	1,500
Oakfield, Herman Creek	500
Pembine, Merryman Creek	1,000
Silver Creek	1,000
Rhinelander, Four Mile Creek	500
Gudegast Creek	500
Hardell Creek	500
Lake Creek	500
Pelican River	1,000
River Falls, Kinnickinnick River	4,500
Stone Lake, Little Godfry Creek	1,000
Pierce Lake	1,000
Stone Lake	1,000
Waukesha, Dopp Creek	2,000
Garret Creek	2,000
Jones Creek	2,000
Minick Creek	2,000
Right Creek	2,000
Williams Creek	2,000
Wisconsin—Continued.	
Wausau, Little Trappe River	500
Pine River	500
Trap River	500
Westby, Clockmaker Creek	500
Kapp Creek	500
Twin Bluff Creek	500
Wilton, Kickapoo River	1,000
Winter, Phelan Creek	1,000
Woodman, Little Green Creek	4,000
Wyoming:	
Beulah, Big Sand Creek	†2,000
Boneti Spring Branch	†1,000
Howes's pond	1,600
Cody, Anderson Creek	4,000
Shoshone River, South Fork	4,000
Douglas, Box Elder Creek	10,000
Green Valley Lake	10,000
La Prele Creek	10,000
Evanston, Bear River	20,000
Mill Creek	15,000
Sulphur Creek	8,000
Yellow Creek	10,000
Kemmerer, Hams Fork Creek	15,000
Lander, Baldwin Creek	3,000
Crescent Lake	2,000
Grave Creek	2,000
Gustave Lake	2,000
Little Popo Agie River	4,000
Louis Lake	3,000
North Fork River	4,000
North Platte, North Platte River	23,000
Powell, Appelgren Lake	3,750
Edmonds Lake	3,750
Enod Lake	3,750
Everett Lake	2,500
Gillette Lake	3,750
Gravel Pit Pond	2,500
Howell Lake	3,750
Loftsgaarden Lake	3,750
Long Lake	3,750
Lucier Lake	3,750
Me Lake	3,750
Sawtooth Lake	3,750
Sheep Creek	2,500
Wardlaw Lake	3,750
Sheridan, Spear Pond (A)	2,500
Spear Bond (B)	2,500
State Fish Hatchery	*100,000
Thermopolis, Cottonwood Creek	8,000
Japan: Kobe, Japanese Government	*101,000
Canada: Magog, Canadian Government	*96,000
Total a	*1,454,200 †250,200 2,574,942

ATLANTIC SALMON.

Disposition.	Number.
Maine:	
Brownsville, Pleasant River	†718,750
Dennysville, Dennys River	†21,000
Dover, Piscataquis River	†625,000
East Machias, East Machias River	†30,000
Grindstone, Penobscot River, East Branch	†312,500
Seebois River	†312,500
Monson, Davis Stream	†312,000
Maine—Continued.	
Oakfield, Mattawamkeag River, East Branch	†648,500
Onawa, Greenwood Stream	†48,600
Orland, Orland River,	887
Total	†3,028,850 887

a Lost in transit, 20,278 fingerlings.

Distribution of fish and eggs, fiscal year 1917—Continued.

LANDLOCKED SALMON.

Disposition.	Number.
Maine:	
Abbott Village, Buttermilk Pond	†5,000
Lake Juanita	†5,000
Sebec Lake	†12,500
Bangor, Penobscot River	†11,000
Bigelow, Little Jim Pond	†5,000
Bucksport, Toddy Pond	10,000
Canton, Lake Anasgunticook	†12,500
Caribou, State fish commission	*301,000
Columbia, Schoodic Pond	†8,000
Dedham, Green Lake	†15,000
Manns Brook	†45,000
Dexter, Puffers Pond	†5,000
Eagle Lake, Eagle Lake	†75,000
East Machias, Gardner Lake	†20,000
East Orland, Toddy Pond	†7,480 9,250
Ellsworth Falls, Vinan Lake	†12,000
Enfield, Cold Stream Lake	†17,500
Farmington, Clear Water Lake	†7,500
Port Kent, Fish River	†27,500
Franklin, Donnell Pond	†10,000
Grand Lake, Dobsis Lake	†28,000 9,000
Grand Lake	†206,000 64,814
Harrington, Schoodic Pond	†8,000
Hartland, Great Moose Lake	†12,500
Jackman, Lake Wood	†10,000
Kennebago, Kennebago Lake	2,000
Kineo, Moosehead Lake	†2,500
Moose River	†27,500
Roach River	†7,500
Newport Junction, Lake Sebasticook	†5,000
Nicolin, Nicolin Lake	†20,000
North Anson, Emden Pond	†10,000
North Belgrade, Belgrade Lake	†12,500
Messalonskee Lake	†12,500
Norway, Virginia Lake	1,600
Otis, Green Lake	†66,219
Phillips Lake, Phillips Lake	†12,000
Portage, Portage Lake	†15,000
Princeton, Big Lake	†20,000
Readfield, Parker Pond	†10,000
South Paris, Abbott Pond	2,531
South Windham, State fish commission	*100,000
Maine—Continued.	
Walkers, Squa Pan Lake	30,000
Webster, Chema Lake	†7,500
Wescott, Little Ossepee Lake	2,511
Wilton, Wilson Lake	†7,500
Massachusetts:	
East Northfield, Applicant	*10,000
Lee, Stockbridge Lake	2,230
New Hampshire:	
Bradford, Massasecum Lake	1,674
Bristol, Newfound Lake	4,185
Canaan, Tewsbury Pond	3,348
Hillsboro, Island Pond	4,185
Keene, Granite Lake	1,674
Silver Lake	2,511
Spofford Lake	2,511
Lebanon, Crystal Lake	5,022
Meredith, Waukewan Lake	1,674
Mountainview, Dan Hole Pond	1,674
Warren, State fish commission	*25,000
New York:	
Arden, Forest Lake	*10,000
Hammondsport, Lake Keuka	†2,000
Long Lake, West Bear Pond	†1,000
Doctors Pond	*5,000
Nehasane, Big Rock Lake	4,000
Lake Lila	4,000
Port Jervis, Wood Lake	†1,970
Raquette Lake, Bettner Ponds	*5,000
Lake Kora	*5,000
Mohegan Lake	*5,000
Warrensburg, State fish commission	*25,000
Vermont:	
Canaan, Big Averill Lake	725
Little Averill Lake	580
Greensboro, Caspian Lake	1,000
Hardwick, Nichols Pond	1,000
Newport, Echo Lake	1,500
Seymour Lake	2,000
Orleans, Willoughby Lake	2,756
Roxbury, State fish commission	*40,000
Total [a]	*531,000 †798,689 177,635

BLACKSPOTTED TROUT.

Disposition.	Number.
Arizona:	
Safford, Fry Canyon Creek	2,000
Marijilda Creek	2,000
Colorado:	
Almont, Spring Creek	10,000
Antero, Antero Lake	25,000
South Platte River	15,000
Aspen, Brush Creek	2,000
Colfax Lake	2,000
Conumdrum Creek	3,000
Lost Man Creek	2,000
Maroon Creek	3,000
Roaring Fork Creek	3,000
Austin, Beaverdam Lake	3,000
Lost Lake	3,000
Youngs Creek	2,000
Avon, Lake Creek, East and West Forks	12,000
Turquoise Lake	15,000
Baldwin, Castle Creek	5,000
Mill Creek	10,000
Ohio Creek	10,000
Pass Creek	5,000
Basalt, Kellys lake	5,000
Bearcreek, Bear Creek	5,000
Colorado—Continued.	
Breckenridge, Upper Blue Lake	3,000
Buena Vista, Cottonwood Lake	4,000
Kroenke Lake	3,000
Middle Cottonwood Creek	8,000
Buffalo, Buffalo Creek	25,000
Goose Creek	4,000
Carbondale, Roaring Fork River	22,500
Castles, Frying Pan River	5,000
Cather Springs, Little Faountain Creek	3,000
Cebolla, Gunnison River	50,000
Chromo, Big Navajo River	17,000
Little Navajo River	7,000
Cimarron, Big Cimarron River	5,000
Big Red Creek	5,000
Cimarron River	8,000
Dry Creek, East and West Forks	5,000
Horsefly Creek	5,000
Little Cimarron River	2,000
Little Red Creek	5,000
Lower Cimarron River	3,000
Roubideau Creek	5,000
Spring Creek	4,000
Coke Ovens, West Dolores River	5,000

[a] Lost in transit, 33,000 fry; 16,530 fingerlings.

Distribution of fish and eggs, fiscal year 1917—Continued.

BLACKSPOTTED TROUT—Continued.

Disposition.	Number.
Colorado—Continued.	
Colorado Springs, Broadmoor Lake	30,000
Como, Sacramento Creek	2,000
Tarryall Creek, North Fork	2,000
Twelve Mile Creek	3,000
Cotopaxi, Cottonwood Creek	5,000
Creede, Rio Grande River	40,000
Crested Bluff, Anthracite Creek	10,000
Brush Creek	10,000
Coal Creek	5,000
East River	5,000
Slate River	5,000
Washington Gulch Creek	5,000
Cripple Creek, Gillett Lake	6,000
Debeque, Big Creek	4,000
Bull Creek	4,000
Buzzard Creek	4,000
Coon Creek	3,000
Grove Creek	3,000
Kahnah Creek	2,000
Mesa Creek	3,000
Plateau Creek	3,000
Del Norte, Elk Creek	10,000
Denver, Bear Creek	12,000
Dillon, Boulder Creek	3,000
Cow Creek	2,000
Martin Creek	2,000
Durango, Canyon Creek	3,000
Cascade Creek	4,000
Clear Creek	3,000
Dutch Creek	3,000
Elk Creek	3,000
Florida River	5,000
Hermosa Creek	9,000
Junction Creek	9,000
La Plata River	10,000
Lightner Creek	5,000
Lime Creek	4,000
Los Pinos Creek, South Fork	3,000
Needle Creek	3,000
Edwards, Squaw Creek	4,000
Eldora, Boulder Creek	40,000
Florence, South Hardscrabble Creek	5,000
Fort Collins, Bennett Creek	†20,000
Joe Wright Creek	†40,000
Little South Poudre River	†80,000
McIntyre Creek	†20,000
Poudre River, North Fork	105,000
Sheep Creek	†10,000
Trap Lake	†15,000
Fraser, Corona Lakes	9,000
Ranch Creek	20,000
Frisco, Meadow Creek	3,000
North Ten Mile Creek	3,000
Georgetown, Clear Creek, South Fork	2,000
Clear Lake	5,000
Green Lake	5,000
Glenwood Springs, Grizzly Creek	10,000
Granby, Bowen Creek	4,500
Fern Lake	7,500
Fish Creek	4,500
Fraser River	20,000
Grand Lake	9,000
Grand River, North Fork	16,000
Indian Creek	10,000
Stillwater Creek	3,000
Strawberry Creek	10,000
Supply Creek	3,000
Willow Creek	6,000
Grand Junction, Blue Creek	12,000
Granite, Clear Creek	4,000
Pine Creek	4,000
Grant, Geneva Creek	33,000
Gypsum, Gypsum Creek	8,000
Hartsel, High Creek	4,000
Hierro, North Beaver Creek	10,000
Sun Creek	10,000
Hinkles, Mill Creek	10,000
Colorado—Continued.	
Hotchkiss, Clear Fork Creek	2,000
Crystal Creek	8,000
Leroux Creek	5,000
Smith Fork Creek	2,000
Idaho Springs, Bear Creek	3,000
Fall River	3,000
Vance Creek	2,000
Lake George, South Platte River, South Fork	5,000
La Veta, Cuchara Creek	5,000
Leadville, Frying Pan River and tributaries	30,000
Mancos, West Mancos Creek	5,000
Midland, Lashbaugh Lakes	3,000
Monte Vista, Alamosa Creek	6,000
Conejos River	6,000
Rock Creek, South Fork	4,000
New Castle, Fawn Creek	3,000
Ripple Creek	3,000
West Miller Creek	3,000
Newett, Teeter's ponds	4,000
North Cheyenne, Cheyenne Creek, North Fork	3,000
Northgate, North Platte River	10,000
Ohio City, Gold Creek	2,000
Ouray, Poughkeepsie Creek	5,000
Pagosa Springs, Big Blanco River	20,000
Little Blanco River	8,000
San Juan River, East Fork	9,000
San Juan River, West Fork	18,000
Pando, Eagle River	30,000
Paonia, East Muddy Creek	10,000
Henderson Creek	3,000
Laroux Creek	5,000
Terror Creek	3,000
Parkdale, Arkansas River	3,000
Parshall, Grand River, South Fork	4,500
Pitkin, Boulder Lake	3,000
Chaney Lake	2,000
Lampshire Lake	3,000
Quartz Creek	5,000
Placerville, Naturita Creek	18,000
Ridgeway, Big Cimarron Creek	5,000
Cow Creek	5,000
Escalante Creek	2,000
Uncompahgre River	5,000
Rifle, Beaver Creek	5,000
East Divide Creek	7,500
West Divide Creek	5,000
Rosemont, East Beaver Creek	15,000
Ruedi, Ruedi Creek	2,000
Smith Creek	2,000
Saderland, Gould Creek	15,000
Salida, Bear Creek	5,000
Sapinero, Curucanti Creek	5,000
Soap Creek	5,000
West Elk Creek	4,000
Shawnee, Deer Creek	25,000
Silverton, South Mineral Creek	3,000
Somerset, Anthracite Creek	3,000
West Muddy Creek	10,000
South Fork, Alder Creek	2,000
Bear Creek	4,000
Dyer Creek	6,000
Elk Creek	2,000
Embargo Creek	2,000
Rio Grande, South Fork	4,000
Willow Creek	4,000
South Platte, South Platte River	25,000
Steamboat Springs, Buffalo Pass Lake	10,000
Harrison Creek	4,500
Mad Creek, North Fork	4,000
Slater Creek	4,000
Stoner Creek, Stoner Creek	5,000
Sulphur Springs, Corral Creek	14,500
Willow Creek	10,000
Sunset, Four Mile Creek	10,000

Distribution of fish and eggs, fiscal year 1917—Continued.

BLACKSPOTTED TROUT—Continued.

Disposition.	Number.
Colorado—Continued.	
Thomasville, Engelbrecht Lake	60,000
Troublesome, East Troublesome Creek	6,000
West Troublesome Creek	7,500
Vasquez, Fraser River	7,500
Vasquez Creek	6,000
Victor, Victor Lake	10,000
Walden, Ute Creek	10,000
Walsenburg, Huerfano River	10,000
Ward, Middle St. Vrain River	3,000
Webster, South Platte River	20,000
Westcliffe, Bear Lake	4,000
Grape Creek	10,000
North Colony Creek	4,000
South Colony Creek	4,000
Wheeler, West Ten Mile Creek	3,000
Wray, Republican River	5,000
Youman, Big Blue Creek	5,000
Michigan:	
Detroit, Applicant	*20,000
East Tawas, Silver Creek	†5,000
Montana:	
Anaconda, Cable Creek	†4,000
California Creek	†6,000
Deep Creek	†6,000
Dutchman Creek	†4,000
Fish Trap Creek	†6,000
Foster Creek	†6,000
La Marsh Creek	†6,000
Lost Creek	†6,000
Mill Creek	†6,000
Seymour Creek	†6,000
State fish commission	*400,000
Warm Springs Creek	†6,000
Willow Creek	†4,000
Billings, Blue Creek	†6,000
Bozeman, Dry Creek	†4,000
Spring Creek	†4,000
Butte, Applicant	*200,000
Carbella, Lower Rock Creek	†4,000
Miner Creek	†4,000
Choteau, Teton River	†12,000
Clyde Park, Bang Tail Creek	†4,000
Canyon Creek	†4,000
Cole Creek	†4,000
Mission Creek	†6,000
Rock Creek	†4,000
Corwin Springs, Big Creek	†6,000
Castle Lake	†6,000
Cedar Creek	†6,000
Cutler Lake	†4,000
Daileys Creek	†4,000
Randall Lake	†4,000
Dell, Cyot Creek	†12,000
Muddy Creek	†12,000
Dillon, Hoffman Creek	†4,000
Emigrant, Dam Creek	†4,000
Lambert Creek	†4,000
Simon Creek	†4,000
Six Mile Creek	†6,000
Forest Grove, Flatwillow Creek, North Fork	†4,000
Hell Creek	†4,000
McCartney Creek	†4,000
Tyler Creek, Spring Branch	†4,000
Tyler Creek, West Fork	†4,000
Gardner, Gardner River	†6,000
Yellowstone River	†6,000
Grannis Siding, Lower Shields River	†6,000
Helena, Prickly Pear Creek	†16,000
Hobson, Antelope Creek	†8,000
Judith Gap, Judith River, Ross Fork	†8,000
Lewistown, Cottonwood Creek	†4,000
McMillan's pond	†4,000
Libby, Pipe Creek	†8,000
Quartz Creek	†8,000
Livingston, Bloom Lake	†4,000
Brisbin Creek	†2,000
Cokedale Creek	†4,000
Elbow Creek	†4,000
Montana—Continued.	
Livingston, Ferry Creek	†4,000
Fleshman Creek	†4,000
Strickland Creek	†4,000
Upper Mission Creek	†4,000
West Boulder River	†6,000
Yellowstone River	†18,000
Missoula, Bitter Root River, branch of	†2,000
Blanchard Creek	†8,000
Camas Creek	†8,000
Cottonwood Creek	†6,000
Grant Creek	†8,000
Johnson Creek	†8,000
Lo Lo Creek	†10,000
Mill Creek	†8,000
Miller Creek	†8,000
Rock Creek	†10,000
Twin Creeks	†4,000
Moccasin, Porter Creek	†6,000
Moore, Fessell's pond	†2,000
Rock Creek	†6,000
Rossfork Creek	†10,000
Pony, North Willow Creek	†8,000
South Willow Creek	†8,000
Watt Lake	†10,000
Pray, Mill Creek, North Fork	†4,000
Mill Creek, South Fork	†4,000
Strawberry Creek	†4,000
Roundup, Flatwillow Creek	†10,000
Willow Creek	†8,000
Sheridan, Indian Creek	†6,000
Mill Creek	†8,000
Wisconsin Creek	†10,000
Shonkin, Shonkin Creek	†10,000
Stevensville, Bass Creek	†6,000
Mill Creek	†6,000
South Burnt Fork Creek	†6,000
Spring Creek	†2,000
Superior, Cedar Creek	†4,000
Deep Creek	†4,000
Dry Creek	†4,000
Fish Creek	†6,000
Flat Creek	†4,000
Fourteen Mile Creek	†4,000
Johnston Creek	†4,000
Lost Gulch Creek	†4,000
Oregon Gulch Creek	†4,000
Quartz Creek	†4,000
Thompson Creek	†6,000
Trout Creek	†6,000
Sweet Grass, Forest Creek	†16,000
Townsend, Dry Creek	†8,000
Greyson Creek	†8,000
Twodot, Big Elk Creek	†8,000
Wilsall, Coal Creek	†4,000
Crandall Creek	†4,000
Daisy Dean Creek	†4,000
Elk Creek, North Fork	†4,000
Flathead Creek, South Fork	†4,000
Flathead Creek, West Fork	†4,000
Horse Creek	†6,000
Little Muddy Creek	†4,000
North Horse Creek	†4,000
Porcupine Creek	†4,000
Potter Creek	†6,000
Shields River, South Fork	†4,000
Smith Creek	†4,000
Upper Flathead River	†4,000
Upper Horse Creek	†4,000
New Mexico:	
Buckman, Pajarito River	5,000
Rito de los Frijoles	3,000
Capitan, Rio Ruideso	5,000
Carlsbad, Carlsbad Creek	2,000
Chama, Brazos River	5,000
Canones Creek	4,000
Chama River	6,000
Chavez Creek	2,000
Nutrias River	5,000

Distribution of fish and eggs, fiscal year 1917—Continued.

BLACKSPOTTED TROUT—Continued.

Disposition.	Number.
New Mexico—Continued.	
Cloudcroft, Water Canyon Creek	3,000
Dexter, Pecos River	1,000
Florida Station, Hadley Creek	2,000
Glorietta, Bear Creek	3,000
Cow Creek	3,000
El Rito del Morero Creek	3,000
Holy Ghost Creek	2,000
Indian Creek	5,000
Jacks Creek	2,000
Mora Creek	2,000
Panchuelo Creek	6,500
Pecos River	12,000
Willow Creek	3,000
Windsor Creek	3,000
Grants, Laguna Redonda	2,000
Laguna, Water Canyon Creek	3,000
Las Vegas, Falls Creek	3,000
Luna Creek	4,000
Pecos River	22,000
Rio de la Casa	2,000
Rio Gallinas	13,000
Tecolote Creek	3,000
Mountainair, Tajique Canyon Creek	6,000
Raton, Palo Blanco Creek	3,000
Schwachheim Creek	3,000
Seighstrom Creek	3,000
Walton Creek	3,000
Waterworks Pond	3,000
Wrigelsworth Creek	3,000
Roberia, Pecos River	5,000
Santa Fe, Capulin River	3,000
Nambe River	5,000
Rio Medio	7,000
Rito Pacheco	2,000
Santa Fe River	13,000
Tesuque River	6,000
Taiban, Taiban Creek	1,000
Taos Junction, Rio Pueblo	5,000
Taos Creek	5,000
Tres Piedras, Rio Vallecitos	6,000
Ute Park, Beaver Creek	3,000
Cimarron River	3,000
Hurricane Creek	1,500
Red River	38,500
Six Mile Creek	3,000
West Agua Fria Creek	3,000
Wagonmound, Tyson Springs Creek	1,000
New York: New York, Aquarium	*10,000
Oregon:	
Bonneville, State fish commission	*250,000
Rogue River, Rogue River	8,000
South Dakota:	
Big Bend, Minnelusa Creek	†2,000
Prairie Creek	†8,000
Englewood, Englewood Creek	†5,000
Rapid Creek	25,000
Hill City, Barthold Pond	†4,000
Horse Creek	†6,000
Hot Springs, Cascade Creek	†8,000
Iron Creek, Iron Creek	51,400
Lead, Spearfish Creek, Upper	†15,000
Whitewood Creek	†20,000
Mystic, Tunnell Creek	†8,000
Pactola, Bogus Jim Creek	†6,000
Jim Creek	†10,000
Keenan Pond	†2,000
Longs Pond	†2,000
Power Lake	†4,000
Victoria Creek	†6,000
Rapid City, Box Elder Creek	†22,000
Canyon Lake	†8,000
City Spring Creek	†4,000
Cleghorn Spring Creek	†4,000
Haley Lake	†4,000
Halls Pond	†4,000
Indian School Lake	†4,000
Lime Creek	†5,000
Rapid Creek	†25,000
Spayde Pond	†4,000
Spring Creek	†24,000
South Dakota—Continued.	
Rochford, Little Rapid Creek	†25,000
Savoy, Spearfish River	†20,000
State fish commission	†30,000
Spearfish, Crow Creek	†15,000
Eccles Creek	†10,000
Higgins Gulch Creek	†10,000
Lindley Creek	†8,000
Schmidt's lake	†15,000
Smith Spring Branch	†5,000
Spearfish Creek	65,000
Spearfish Creek, branches of	†31,000
Spring Creek	25,000
Watercress Creek	†5,000
Willow Creek	†6,000
Sturgis, Bear Butte Creek	†25,000
Utah: Murray, State fish commission	*100,000
Washington:	
Aberdeen, Charley Creek	†6,000
Chenoise Creek	†4,000
Elk River	†6,000
Hoquiam River	†6,000
Humptulips River	†6,000
Indian Creek	†4,000
Johns River	†4,000
Stevens Creek	†8,000
Van Winkle Creek	†4,000
Wynoochee River	†4,000
Asotin, Asotin Creek	†20,000
Chelan, Antilon Lake	†8,000
Cleelum, Applicant	*50,000
Kelso, Clark Creek	†4,000
Owl Creek	†4,000
Northport, Deep Creek	†4,000
Little Sheep Creek	†4,000
Onion Creek	†4,000
Sheep Creek	†6,000
Port Angeles, State fish commission	*150,000
Snoqualmie, Applicant	*50,000
Stevenson, Lake Toketa	†8,000
Nocena Lake	†6,000
Tacoma, Canada Creek	†6,000
Chambers Creek	†6,000
Chenius Creek	†6,000
Clear Creek	†6,000
Falls Creek	†6,000
Golden Lake	†6,000
Hylebos Creek	†6,000
Lake Ethel	†6,000
Lake James	†6,000
Little Mashell River	†6,000
Ranger Creek	†6,000
Rushing Water Creek	†6,000
Skukewush Creek	†6,000
South Mowich River	†6,000
Vancouver, Bert Creek	†8,000
Big Creek	†8,000
Cedar Creek	†8,000
Little Washugal River	†8,000
Washgual River	*50,000 †8,000
Washgual River, North Fork	†8,000
Walla Walla, State fish commission	*50,000
Wyoming:	
Bonneville, Big Horn River	†14,000
Clearmont, Crazy Woman Creek, Middle Fork	†11,000
Mabel Lake	†11,000
Magdalene Lake	†10,000
Muddy Creek	†12,000
Paradise Lake	†12,000
Tiger Lake	†10,000
Cody, Anderson Creek	†8,000
Eleanor Creek	†8,000
Shoshone River, North Fork	†12,000
Shoshone River, South Fork	†12,000
Sunlight Creek	†8,000
Wood River	†12,000
Cow Creek, Cow Creek	20,000
Encampment, Encampment Creek, South Fork	135,000

Distribution of fish and eggs, fiscal year 1917—Continued.

BLACKSPOTTED TROUT—Continued.

Disposition.	Number.	Disposition.	Number.
Wyoming—Continued.		Wyoming—Continued.	
Jack Creek, Jack Creek	190,000	Sheridan, Sackett Pond	†8,000
Laramie, State fish commission	*100,000	State fish commission	*100,000
Manderson, Nowood River	†37,400	Twin Lakes	†6,000
State fish commission	*100,000	Spring Creek, Spring Creek and tributaries	70,000
Newcastle, M. W. Ranch Lake	†20,000	Yellowstone, Bridge Creek	†42,000
Pass Creek, Pass Creek	60,000	Buffalo Creek	†60,000
Powell, Chain of Lakes	†12,000	Clear Creek	†28,000
Mirror Lake	†12,000	Columbine Creek	†21,000
Rock Creek, Rock Creek	20,000	Pelican Creek	†42,000
Rock River, Sand Lake	15,000		
Saratoga, North Platte River	50,000		
Sheridan, Jackson Creek	†15,000	Total *a*	*1,630,000 †2,051,400 2,683,900
Lake Geneva	†10,000		
Rapid Creek	†15,000		

LOCH LEVEN TROUT.

South Dakota:		South Dakota—Continued.	
Belle Fourche, Orman Reservoir	25,835	Deadwood, City Park Lake	25

LAKE TROUT.

Colorado:		Michigan—Continued.	
Leadville, Twin Lakes	40,000	Point Abbaye, Keweenaw Bay	†100,000
Montrose, Tripler Lake	10,000	Presque Isle, Lake Superior	†565,000
Illinois: Chicago, Applicant	*2,000	St. Ignace, Lake Michigan	†157,500
Iowa: Spirit Lake, State fish commission	*100,000	St. Joseph, Lake Michigan	†429,000
Maine:		Sault Ste. Marie, State fish commission	*8,640,000
Greenville Junction, State fish commission	*100,000	Scarecrow Island, Lake Huron	†1,022,000
Winthrop, State fish commission	*100,000	Sidnaw, Hauger Lake	8,000
Massachusetts:		Skillagallee Reef, Lake Michigan	†931,000
Chester, Big Pond	2,500	Tobens Harbor, Lake Superior	†600,000
Lee, Goose Pond	2,500	Todds Harbor, Lake Superior	†600,000
Greenwater Pond	2,500	Traverse Island, Keweenaw Bay	†100,000
Laurel Lake	2,500	Washington Harbor, Lake Superior	200,000
Shaw Pond	2,500	Wrights Island, Lake Superior	†492,000 480,000
Stockbridge Lake	2,500	Minnesota:	
Michigan:		Burlington Point, Lake Superior	†550,000
Big Rock Reef, Lake Michigan	†1,148,000	Duluth, Lake Superior	100,000
Charlevoix, Lake Michigan	†1,148,000	Encampment Island, Lake Superior	†500,000
Charlevoir Reef, Lake Michigan	†1,148,000	French River, Lake Superior	†550,000
Covington, Worm Lake	6,000	Grand Portage, Lake Superior	†802,500
Crystal Falls, Berg's pond	†6,000	Knife River, Lake Superior	†500,000
Detour, Lake Huron	†380,000	Pillinger, Shamneau Lake	10,000
Escanaba, Lake Michigan	†105,000	St. Paul, State fish commission	*3,300,000
Fishermens Home, Lake Superior	†492,000 480,000	Stewart River, Lake Superior	†550,000
Fish Island, Lake Superior	†564,000	Sucker River, Lake Superior	†550,000 498,000
Fishermens Island, Lake Michigan	†2,296,000	Susie Island, Lake Superior	†627,500
Gaylord, Brink Lake	†6,000	Montana:	
Gull Island Reef, Lake Huron	†1,024,000	Whitefish, Beaver Lake	16,500
Horseshoe Reef, Lake Michigan	†1,095,000	Whitefish Lake	21,000
Iron River, Iron Lake	†6,000	New Hampshire:	
Pickerel Lake	†9,000	Bradford, Long Pond	4,000
Sunset Lake	†12,000	Massassecum Lake	4,000
Isle Royal, Lake Superior	480,000	Bristol, Newfound Lake	10,000
King Lake Siding, Big King Lake	6,000	Fitzwilliam, Laurel Lake	4,000
Little King Lake	6,000	Lebanon, Cole Pond	9,600
Long Point, Lake Superior	960,000	Crystal Lake	1,500
McCargoes Cove, Lake Superior	†200,000	Pike, Lake Tarleton	2,413
Manistee, Lake Michigan	†432,000	New York:	
Manistique, Lake Michigan	†283,500	Albany, State fish commission	*3,000,000
Marquette, Lake Superior	†490,000	Allan Otty Shoal, Lake Ontario	†337,500
Munising, Lake Superior	250,000	Au Sable Forks, Crystal Lake	†9,000
Nine Mile Point, Lake Michigan	†1,094,000	Taylor Pond	†6,000
Northpoint Reef, Lake Huron	†872,000	Bear Point, Lake Ontario	†209,600
Old Flathead Reef, Lake Michigan	†1,094,000	Caledonia, State fish commission	*2,490,000
Piney River, Keweenaw Bay	†300,000	Charity Shoals, Lake Ontario	†1,021,000

a Lost in transit, 1,000 fry; 14,500 fingerlings.

Distribution of fish and eggs, fiscal year 1917—Continued.

LAKE TROUT—Continued.

Disposition.	Number.
New York—Continued.	
Dutch Point, Lake Ontario	†368,000
Fox Island, Lake Ontario	†697,500
Grenadier Island, Lake Ontario	†1,642,450
Hammondsport, Lake Keuka	†10,000
Interlaken, Cayuga Lake	†10,000
Lake George, Lake George	†15,000
Lake Placid, Lake Placid	†20,000
Long Lake West, Loon Pond	*50,000
Northville, Sacondaga Lake	†8,000 1,600
Pigeon Island, Lake Ontario	†100,000
Point Peninsula, Lake Ontario	†638,500
Port Henry, Clear Pond	†6,000
Port Jervis, Cahoozie Lake	†9,000
Raquette Lake, Lake Sagamore	*50,000
Redwood, Millsite Lake	†15,000
Riverside, Paradox Lake	†10,000
Schroon Lake	†10,000
Saranac Lake, Pine Pond	†15,000
Skaneateles Junction, Skaneateles Lake	†36,000
Stony Point, Lake Ontario	†630,250
Tibbetts Point, Lake Ontario	†491,355
Ohio:	
Grafton, Quarry Pond	†3,000
Isle of St. George, Lake Erie	†490,000
Marblehead, Lake Erie	†500,000
Put in Bay, State fish commission	*600,000
Oregon: Bonneville, State fish commission	*1,000,000
Pennsylvania:	
Bellefonte, State fish commission	*500,000
Pleasant Mount, State fish commission	*500,000
South Dakota:	
Bellefourche, Ormande Reservoir	13,500
Rapid City, Boegel's pond	750
Electric Light Pond	1,500
Thompson's pond	750
Vermont:	
Barton, Crystal Lake	3,750
Bennington, State fish commission	*100,000
Canaan, Big Averill Lake	1,825
Greensboro, Caspian Lake	1,470
Hardwick, Nichol's pond	1,600
Holden, Lake Dunmore	2,500
Middlebury, Lake Dunmore	6,000
Orleans, Long Pond	3,900
Willoughby Lake	4,000
Roxbury, State fish commission	*1,400,000
Washington: Tonasket Applicant	*200,000
Wisconsin:	
Bayfield, State fish commission	*3,000,000
Delta, Spring Lake	†10,000
Donaldson, Black Oak Lake	10,000
Gordon, Eau Claire Lakes	†10,000
Madison, State fish commission	*4,000,000
State fish commission	*6,000,000
Pelican, Pelican Lake	8,000
Pembine, Boulder Lake	†9,000
Coldwater Lake	†9,000
Lindquist Lake	†9,000
Round Lake	†9,000
Port Wing, Lake Superior	†2,200,000
Wyoming:	
Clearmont, Paradise Lake	1,000
Lander, Atlantic Lake	2,500
Louis Lake	2,500
Poposia Lake	2,500
Pyramid Lake	2,500
Sandy Lake	2,500
Laramie, State fish commission	*100,000
Riverton, Brooks Lake	2,500
Sheridan, State fish commission	*100,000
Total [a]	*35,332,000 †33,395,155 3,699,158

BROOK TROUT.

Disposition.	Number.
Alaska: Juneau, Salmon Creek Lake	*150,000
Arizona:	
Globe, Reynolds Creek	4,000
Tempe, Tonto Creek	4,000
California:	
Baird, Salt Creek	5,000
Sacramento River, branch of	5,000
Colton, Fox Creek	1,000
Fox Lake	1,000
El Monte, Win Mor Pond	1,000
Hancock, Squaw Creek	5,000
Hickman, Riverview Lake	1,000
Lancaster, McIntosh's pond	1,000
Point Reyes Station, Lime Gulch Creek	*25,000
Rosamond, Graves's pond	1,000
Truckee, Martis Creek	2,000
Prosser Creek	7,000
Colorado:	
Antero, Antero Lake	6,000
Aspen, Express Creek	9,000
Austin, Twin Lakes	15,000
Bailey, Deer Creek	1,500
South Platte River	84,000
Basalt, Cattle Creek	15,000
Biglow, Last Chance Creek	12,000
North Frying Pan River	15,000
Boulder, Boulder Creek	18,000
Bowie, Hubbard Creek	10,000
Buena Vista, Days Lake	6,000
Canon City, Beaver Creek	15,000
Colorado—Continued	
Cimarron, Big Cimarron River	31,000
Lake No. 2	10,000
Lake No. 3	8,000
Silver Tip Lake	12,000
Cliff, South Platte River	66,000
Colona, Buckhorn Lake	1,000
High Park Lake	2,000
Onion Creek Lakes	2,000
Sink Hole Lake	1,000
Tie Camp Lake	1,000
Colorado Springs, Fountain Creek	25,000
Langridge Ponds	25,000
Creede, Red Mountain Creek	10,000
Rio Grande River	15,000
Shallow Creek	10,000
Sunnyside Creek	10,000
Trout Creek	10,000
Cripple Creek, Gehm's pond	3,000
Crossons, Crossons Nursing Pond	500
Curtin, Uneva Lake	9,000
Delta, Current Creek	10,000
Dirty George Creek	4,000
Happy Hollow Creek	18,000
Surface Creek	15,000
Youngs Creek	40,000
Denver, Bear Creek	20,000
Covert's pond	800
Indian Creek	5,000
Dillon, Slate Creek	10,000
Divide, Loshbaugh's pond	6,000

[a] Lost in transit, 25,000 fry; 1,565 fingerlings.

Distribution of fish and eggs, fiscal year 1917—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Colorado—Continued.	
Durango, Florida River	10,000
Eagle, Brush Creek	36,000
Eldora, Boulder Creek, North Fork	20,000
Lake Eldora	9,000
Fraser, Corona Lakes	20,000
Glenwood Springs, Grizzly Creek	24,000
No Name Creek	10,000
Granby, Baker Creek	10,000
Grand River	15,000
Granite, Clear Creek	100,000
Grant, Blue River	2,500
Greenland, Alice Reservoir	6,000
Green Mountain Falls, Catamount Creek	9,000
Hillside, Road Pond	2,000
Hill Siding, North Boulder Creek	80,000
Hotchkiss, Crystal Creek	5,000
Smith Fork Creek	5,000
Idaho Springs, Lake Edith	36,000
Iola, Rainbow Lake	10,000
Ivanho, Ivanho Lake	15,000
Lyle Creek	6,000
Morman Lake	20,000
Jefferson, Rock Creek	15,000
Lake City, Gunnison River, Upper Lake Fork	16,000
Lake George, Pierce's pond	6,000
South Platte River	4,500
Leadville, Arkansas River	71,000
Badger Creek	8,000
Box Creek	6,000
Crystal Lake	25,000
Half Moon Creek	53,000
Lake Creek	76,000
Lake Park Creek	15,000
Musgrove Lake	120,000
Rock Creek	15,000
Tennessee Creek	33,000
Timber Line Lake	15,000
Turquoise Lake	202,000
Twin Lakes	44,000
Twin Lakes Creek	15,000
Union Creek	21,000
Willow Creek	22,000
Loveland, St. Vrain River	15,000
Maddox, Platte River	20,000
Malta, Frenchman Pond	500
Smith Ponds	9,000
Marble, Lizard Lake	10,000
Snow Mass Creek	6,000
Marshall Pass, Arkansas River, North Fork	20,000
Greens Gulch Creek	20,000
Littel Cochetopa Creek	20,000
Poncho Creek	20,000
Silver Creek	20,000
Meredith, Jakenson Creek	5,000
Minturn, Cross Creek	15,000
Echo Lakes	9,000
Gore Creek	10,000
Montrose, Spring Creek	15,000
Swanson Lake	1,000
Nast, Cunningham Creek	2,500
Frying Pan River	55,000
Frying Pan River, South Fork	25,000
Ivanhoe Creek	5,000
Norrie, Chapman Creek	15,000
Chapman Lake	30,000
Frying Pan River	30,000
Olathe, Heckert's lake	15,000
Ouray, Dallas Club Lake	3,000
Pando, Eagle River	75,000
Parkdale, Arkansas River	37,000
Phillipsburg, Walton Creek Lake	20,000
Prospect, Lily Lake	10,000
Mountain View Lake	20,000
Wood Creek	5,000
Red Cliff, Homestake Creek	15,000
Colorado—Continued.	
Ridgway, Dallas Creek	15,000
Rifle, Rifle Creek	15,000
Ruedi, Freeman Creek	2,500
Frying Pan River	30,000
Rocky Fork Creek	5,000
Salida, Pass Creek	51,000
Poncha Creek	9,000
South Arkansas River	25,000
Sapinero, Gunnison River	20,000
Sellar, Sellar Lake	5,000
Shawnee, Deer Creek	22,000
Shoshone, No Name Creek	6,000
Silverton, Molas Creek	5,000
South Mineral Creek	5,000
Sloss, Frying Pan River	10,000
South Platte, South Platte River, South Fork	9,000
Thomasville, Eagle Lake	2,500
Engelbrecht Lakes	230,000
Howard Lake	4,000
Lime Creek	5,000
Spring Creek	30,000
Trinidad, Arkansas River	25,000
Purgatory River, Middle Fork	40,000
Victor, Beaver Lake	6,000
Bison Park Lake	30,000
Hughlitt's pond	4,000
Skaguay Lake	6,000
Webster, South Platte River	18,000
Weller, Clear Creek	12,500
Woodland Park, Club Pond	1,500
Crystal Pond	6,000
Engelbrecht Lakes	50,000
Fourth Lake	15,000
Hay Creek	9,000
Lake No. 2	9,000
Northfield Lakes	18,000
Woodland Park Lakes	73,000
Connecticut:	
Bethel, Diamond Hill Brook	400
Flanders, Won-Bec-Water Creek	3,125
Forestville, Morris Pond	300
Granby, Hurricane Brook	300
Hartford, Broad Brook	2,300
Spring River	2,000
West Brook	800
New Canaan, Five-Mile River	2,500
Frog Town Brook	3,000
Mill River	5,000
Mill River, East Branch	3,000
Norwalk River, West Branch	2,500
Silvermine River	5,000
New London, Beaver Brook	†8,000
Cedar Brook	†7,000
Jordan Brook	†8,000
Latimers Brook	†16,000
New Milford, Cobble Brook	400
Merwin Brook	300
West Aspatuck River	3,200
Plantsville, Plants Pond	200
Simsbury, Bissell Brook	250
Salmon Brook	250
Southington, Vlasto's pond	400
Willimantic, Applicant	*2,000
Mount Hope River, West Branch	1,200
Norman Clark Brook	†4,000 4,000
Georgia: Tallulah Falls, Tallulah River	1,000
Idaho:	
Lenore, Trout Lake	300
Spencer, Indian Springs Pond	300
Wallace, Big Creek	1,000
Coeur d'Alene River, North Fork	1,600
Frazier Creek	800
Placer Creek	1,000
Slate Creek	1,000

Distribution of fish and eggs, fiscal year 1917—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Illinois: Spring Grove, State fish commission	*50,000
Indiana:	
Elkhart, Heaton Lake Creek	†15,000
Hobart, Duck Creek	†10,000
Michigan City, Cowin Brook	†10,000
Spring Brook	†10,000
Wabash, Swank Creek	†20,000
Iowa:	
Cresco, Baldwin Creek	1,000
Rutherford Creek	1,000
Spirit Lake, State fish commission	*50,000
Maine:	
Attean, Attean Lake	†9,000
Clearwater Pond	†9,000
Moose Pond	†9,000
Toby Pond	†9,000
Williams Brook	†9,000
Bar Mills, Silver Brook	†28,000
Belfast, St. Georges Lake	†30,000
Bingham, Decker Ponds	1,500
Blanchard, Bunker Pond	†8,000
Bluehill Falls, Motherbush Pond	2,000
Castine, Fresh Pond	3,000
Columbia Falls, Peaked Mountain Pond	†21,000
Dedham, Branch Pond	†50,000
Dexter, Jumper Brook	†6,000
Lake Wassookeag	†27,000
Pitts Brook	600
Puffer Pond	†15,000
Eagle Lake, Eagle Lake	†114,000
Square Lake	†57,000
East Orland, Craig Pond	†50,000 2,500
Gully Brook	†15,000
Patten Pond	†16,000 500
Wardwell Brook	†15,000
Ellsworth, Branch Pond	†50,000
Ellsworth Falls, Beech Hill Pond	†21,000
Enfield, Trout Pond	†12,000
Grand Lake Stream, Bonny Brook	†5,000
Gardner Brook	†3,600
Spring Brook	†5,000
Sunset Brook	†10,000
Green Lake, Green Lake	†70,000
Harmony, Grant Brook Pond	†21,000
Harrington, Schoodic Pond	†14,000
Hinckley, Lake George	†21,000
Holeb, Barrett Pond	†15,000
Bog Brook	†15,000
Deer Pond	†16,000
Indian Pond	†6,000
Lowell Pond	†10,000
Moose River	†50,000
Holden, Hatcase Pond	†30,000
Island Falls, Pleasant Pond	†18,000
Jackman, Attean Lake	†12,000
Benjamin Pond	†8,000
Big Churchill Creek	†12,000
Big Turner Pond	†8,000
Bog Pond	†16,000
Boulder Pond	†8,000
Campbell Pond	†3,000
Clearwater Pond	†8,000
Coburn Pond	†12,000
Crocker Pond	†16,000
Damond Pond	†12,000
First Toby Pond	†12,000
Gander Brook	†12,000
Grace Pond	†8,000
Halfway Pond	†16,000
Heald Creek	†12,000
Horse Brook	†12,000
Horseshoe Pond	†8,000
Jim Mack Pond	†12,000
Little Big Wood Pond	†16,000
Maine—Continued.	
Jackman, Little Churchill Creek	†16,000
Little Turner Pond	†12,000
Little Wood Pond	†8,000
Long Pond	†24,000
Lost Pond	†12,000
Luther Pond	†12,000
Moores Pond	†8,000
Moose River	†32,000
Moses Holden Pond	†8,000
Newton Pond	†12,000
Rancourt Pond	†8,000
Sandy Stream	†8,000
Smith Pond	†8,000
Stony Brook	†8,000
Sugar Berth Pond	†12,000
Supply Pond	†8,000
Three Streams	†8,000
Whipple Pond	†8,000
Kennebago, Johns Pond	1,975
Kennebago Lake	3,000
Little Kennebago Lake	1,975
Kineo, Moose River	†24,000
Scotean River	†15,000
Tomhegan River	†12,000
Kingfield, Day Brook	†17,500
Tufts Pond	†17,500
Lincolns Mills, Alder Brook	600
McGeorges Siding, Cathance Lake	†28,000
Machias, Simpson Pond	†28,000
Monmouth, Purgatory Lake	2,000
Tacoma Lake	2,000
North Anson, Embden Pond	2,000
Norway, Virginia Lake	1,600
Old Orchard, Mansion House Pond	†7,000
Oquossoc, State fish commission	*100,000
Otis, Green Lake	†102,676
Patten, Green Pond	†21,000
Hale Pond	†21,000
Pleasant Lake	†21,000
Tote Road Pond	†15,000
Phillips Lake, Phillips Lake	†50,000
Portage, Portage Lake	†36,000
Portland, Beaver Brook	†7,000
Brandy Brook	†10,500
Clyfdale Pond	†17,500
Highland Lake, tributaries of North Branch	†10,500
Little River	†10,500
Nonesuch River	†21,000
Pleasant River	†17,500
Red Brook	†10,500
Princeton, Huntley Brook	†17,500
Saco, Boothby Brook	†14,000
Boynton Brook	†14,000
Burham Brook	†17,500
Deep Brook	†21,000
Foxwell Brook	†14,000
Fresh Water Brook	†17,500
Goose Fair Brook	†21,000
Harmon Brook	†14,000
Holmes Brook	†14,000
Kay Brook	†10,500
Lord Brook	†14,000
Meade Brook	†17,500
Murch Brook	†14,000
Ricker Brook	†14,000
Sandy Brook	†14,000
Stuart Brook	†14,000
Searsport, Swan Lake	†27,000
South Berwick, Knights Pond	†10,500
South Paris, Concord River	†17,500
Shagg Pond	2,000
Washburn Pond	†7,000
South Penobscot, Fourth Pond	1,500
Wights Pond	3,000
Waldoboro, Slaigo Brook	2,000

Distribution of fish and eggs, fiscal year 1917—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Maine—Continued.	
Walkers, Blackwater Brook	†9,000
	2,000
Squa Pan Brook	†6,000
	2,000
Squa Pan Lake	†39,000
Waterville, Britton Lake	†30,000
West Ellsworth, Patten Pond	75,000
Whitneyville, Arna Meadow Brook	†10,500
Maryland:	
Baltimore, Applicant	*3,600
Cumberland, Flintstone Creek	1,000
Deer Park, Glade Run	800
Frostburg, Big Shade Run	800
Big Laurel Run	800
Little Shade Run	800
Puzzley Run	800
Spiker Run	800
Germantown, Jones Creek	612
Glen Echo, Little Paint Branch	500
Hagerstown, Lanes Run	1,800
Leitersburg Run	2,000
Stakes Run	3,000
Lonaconing, Browns Run	1,200
Mountain Lake Park, Little Youghiogheny River	2,400
Oakland, Black Run	400
Bradley Run	400
Browning Pond	1,600
Elk Lick Run	1,170
Folly Run	1,170
Glade Run	800
Herrington and Kessner Run	400
Lake Beulah	400
Murley Brook	1,600
North Cherry Creek	800
Toliver Run	400
Totten Run	540
Wilson Run	800
Rockville, Lakes Brook	1,000
Massachusetts:	
Barre, Gaston's pond	2,500
Clinton, Bowers Brook	1,500
Burkes Brook	1,500
Collins Brook	3,400
Cushman, Roaring Brook	†6,000
Hartsville, Konkapot River	82,000
Hinsdale, Knapp Brook	2,000
Stevens Creek	5,000
Kingston, Furness Brook	6,000
Lee, East Beartown Brook	1,000
East Lee Brook	1,000
Hopp Brook	1,000
Peggy Brook	1,000
Stockbridge Lake	300
Tyringham Brook	1,000
Washington Brook	2,000
West Beartown Brook	1,000
Leominster, Fall Brook	10,000
Spectacle Pond	5,000
Pittsfield, Furnace Brook	1,000
Sackett Brook	1,000
Town Brook	1,000
Yokum River	1,000
Shelburne Falls, Avery Brook	†5,000
Bassett Brook	†5,000
Bear River	†5,000
Branch Creek	†5,000
Clark Brook	†5,000
Clesent River	†5,000
Dragon Brook	†5,000
Drake Brook	†4,000
Fox Brook	†3,000
Hawks Brook	†5,000
Mill River	†5,000
North River	†4,500
Schneck Brook	†4,000
Steel Brook	†4,000
Wilcox Brook	†3,000
Wilder Brook	†4,000
Tyngsboro, Butterfield Pond	3,000
Massachusetts—Continued.	
Wellsley Farms, Indian Spring Brook	2,400
Westboro, Cedar Brook	5,000
Westfield, Big Powder Mill Creek	5,000
Great Brook	7,000
Jacks Brook	2,000
Little Powder Mill Brook	2,000
Little River	7,900
Loomis Street Brook	7,000
Manhan River	8,000
Potash Brook	2,000
Reservoir Brook	2,000
Roaring Brook	2,000
Sandy Mill Brook	2,000
Michigan:	
Baldwin, Baldwin Creek and Branches	†20,000
Bessemer, Massie Run	1,500
Beulah, Cold Creek	8,000
Branch, Weldon Creek	†20,000
Chassell, Paradise Brook	1,500
Copemish, Betsey River	8,000
Covington, Case Creek	1,500
Dreher Creek	1,500
Rock Creek	1,500
Watson Creek	1,500
Crystal Falls, Briar Hill Creek	1,500
Brule Lake	3,000
Lower Deer River	3,000
Daggett, Johnson Creek	3,000
East Tawas, Au Sable River	†50,000
Indian Creek	†20,000
Loud Creek	†20,000
Vaughn Creek	†20,000
Farwell, Chippewa River and branches	†20,000
Hillman, Brush Creek	15,000
Bullock Creek	30,000
Pike Creek	5,000
Houghton, Poppy Creek	3,000
Indian River, Little Pigeon River	†50,000
Twin Lake Branch	†50,000
Iron River, McColman Creek	1,500
McAllister Creek	1,500
Silver Creek	1,500
Ishpeming, Clear Water Creek	6,000
Gold Mine Creek	5,000
Green Creek	11,000
Peshekeeme River	16,000
West Branch	6,000
Jackson, Crouches Creek	†25,000
Kingsley, East Creek	†20,000
Grays Creek	†20,000
Lake Gerald, Little Elm Creek	1,500
Lake Linden, Chantonaw Creek	1,500
Dreamland Creek	1,500
Spring Brook	1,500
Leo Siding, Kelsey Creek	1,500
Lucas, Clam River	8,000
McBains, Clam River	8,000
Marenisco, Alder Creek	1,500
Ash Creek	1,500
Balsam Creek	1,500
Barrs Brook	1,500
Bear Creek	1,500
Beaver Brook	1,500
Birch Creek	1,500
Cedar Creek	1,500
Clam Creek	1,500
Dandy Browns Brook	1,500
Douglass Creek	1,500
Foleys Creek	1,500
Forbs Brook	1,500
Fosters Brook	1,500
Fox Creek	1,500
Fur Creek	1,500
Hazel Creek	1,500
Hoffman Creek	1,500
Honeymoon Creek	1,500
Iron Creek	1,500

Distribution of fish and eggs, fiscal year 1917—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Michigan—Continued.	
Marenisco, Jimmie Thomas Brook.	1,500
Jones Brook	1,500
Lemon Creek	1,500
Little Coon Creek	1,500
Little Spring Creek	1,500
McKinney Creek	1,500
Mays Creek	1,500
Munroe Creek	1,500
Nine Mile Creek	1,500
Otter Creek	1,500
Pigeon Creek	1,500
Rowe Creek	1,500
Ryan Creek	1,500
Sampson Creek	1,500
Schamel Creek	1,500
Slippery Elm Creek	1,500
Stabler Creek	1,500
Sutherland Creek	1,500
Tamarack Creek	1,500
Triplett Creek	1,500
Weazel Creek	1,500
Willow Creek	1,500
Marion, Clam River	8,000
Mass, Fire Steel River	6,000
Metropolitan, Sturgeon Creek, West Branch	3,000
Negaunee, Escanaba River	10,000
Spring Creek Pond	2,000
Ten Kiln Creek	5,000
Niles, Dowagiac Creek	10,000
McCoy Brook	6,000
Walton Brook	4,000
Nirvana, Pere Marquette River and branches	†20,000
Ontonagon, Cranberry River	7,500
Cunningham Creek	3,000
Deer Creek	3,000
Paddys Creek	1,500
Perch Siding, Cold Creek	1,500
Perch River	1,500
Pori, Leveque Creek	3,000
Raco, Pine River, tributaries of	12,000
Rockland, Flintsteel River	4,500
Rockland Creek	3,000
Rock River, Rock River	8,000
Stager, Nault Creek	1,500
Stager Creek	3,000
Stephenson, Belgey Brook	3,000
Stonington, Lake Grace	3,000
Tioga Siding, Hickey Creek	3,000
Wellston, Cedar Creek	†15,000
Pine Creek	†40,000
Wingleton, Bauman and Cedar Creeks	†20,000
Yuma, Slagle Creek	†30,000
Minnesota:	
Byron, Bear Creek	4,900
Caledonia, Crooked Creek, South Fork	480
Crystal Valley Creek	480
Dexter Creek	480
Thompson Creek	480
West Beaver Creek	480
Winnebago Creek	480
Clearbrook, Clearbrook Creek	10,000
Ruffy Brook	16,000
Fairbanks, Wolf Creek	8,000
Harmony, Elliott Creek	2,550
Maland Creek	850
Morem Creek	850
Houston, Badger Creek	850
Bridge Creek	850
Campbell Creek	850
Daily Creek	850
East Beaver Creek	850
Crystal Valley Creek	850
Looney Valley Creek	850
Money Creek	850
Minnesota—Continued.	
Houston, Storer Valley Creek	850
Swede Bottom Creek	850
Knife River, Baptism River	8,000
Manitou River	†5,000
Temperance River	8,000
Larsmont, Launsberry's pond	2,000
Lewiston, Enterprise Creek	1,400
Ferguson Creek	700
Hemingway Creek	1,400
Pine Creek	1,406
Little Falls, Skunk Creek	4,500
Pickwick, Trout Creek	†24,000
Pillager, Peterson Creek	3,000
Rochester, Badger Creek	1,400
Bear Creek	1,400
Trout Creek	700
Rushford, Big Spring Creek	850
Birchdale Creek	850
Camp Creek	850
Collridge Creek	850
Daley Creek	850
Diamond Creek	850
Enterprise Creek	850
Ferguson Creek	850
Ferndale Creek	850
Gaffney Spring Creek	850
Gribbin Creek	850
Hazard Creek	850
Hemmingway Creek	850
Iverson Creek	850
Jensen Creek	850
Meade Creek	850
Opheim Creek	850
Overland Creek	850
Pine Creek	850
Rush Creek	1,700
Silver Creek	850
Torkelson Creek	850
Vigiland Creek	850
Wiscoy Creek	1,700
St. Charles, Campbell Creek	1,200
Carter Creek	600
Crow Creek	1,200
Culbertson Creek	600
Demuth Creek	1,200
Drakes Creek,	1,200
Fays Creek	600
Ferguson Creek	600
Hemmingway Creek	1,200
Hendee Creek	600
Holms Creek	1,200
Holtz Creek	1,200
Logan Branch	1,200
Loudens Creek	600
Nichols Creek	600
Pettis Creek	1,800
Pfeils Creek	600
Pine Creek	600
Quincy Creek	1,200
Rush Creek	600
Slarins Creek	600
Trout Creek	1,800
Troy Creek	1,200
Whitewater River	600
Whitewater River, Middle Branch	1,800
Whitewater River, North Branch.	1,200
Whitewater River, South Branch.	1,200
Wilson Branch	600
Sugar Loaf, Pleasant Valley Creek	†6,000
West Burns Creek	†10,500
Winona, Beaver Creek	1,000
Conedale Creek	2,000
Gilmore Valley Pond	1,200
Willow Pond	1,200
Montana:	
Alder, Rubey River	900
Arlee, Agency Creek	675
Finley Creek	1,675

Distribution of fish and eggs, fiscal year 1917—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Montana—Continued.	
Arlee, Jocko River	3,500
Spring Creek	1,450
Belgrade, Benhart Creek	4,000
Bull Creek	5,000
Cottonwood Creek	4,000
Cowen Creek	4,000
Dry Creek	11,000
East Gallatin River	9,000
Middle Creek	12,000
Pass Creek	5,000
Reese Creek	6,000
Ross Creek	7,000
Story Creek	5,000
Thompson Creek	5,000
Big Timber, Coulee Creek, North Fork	3,500
Browning, Arnoux Creek	1,200
Milk River, Middle Fork	2,000
Choteau, Sun River	1,600
Darby, Bitter Root River	600
Dell, Red Rock River	2,000
Sheep Creek	2,000
Dodson, Lodge Pole Creek	2,000
East Bridges, Chain of Lakes	2,600
Florence, Three Mile Creek	1,200
Forest Grove, Flatwillow Creek, West Fork	1,200
McCartney Creek	600
Surenough Creek	600
Glacier Park, Cutbank River	2,000
Grinnell Lake	2,000
Gunsight Lake	2,000
Lake Josephine	2,000
Lake Mary Ellen Wilson	2,000
Red Eagle Lake	2,000
St. Marys Lake	3,000
Hamilton, Spring Creek	15,000
Havre, Beaver Creek	400
Hedges, Careless Creek	2,000
Swimming Woman Creek	2,000
Hobson, Springdale Creek	3,000
Lewistown, Castle Creek	450
Lake Paradise	750
Marquette River	11,000
Spring Creek, East Fork	10,800
Martinsdale, Basin Creek	10,000
Richmond Creek	10,000
Missoula, Browns Lake	1,800
Dusett Creek	675
Kleinsmith Lake	1,575
Rattlesnake Creek	1,800
Moccasin, Louse Creek	3,000
Norris, North Meadow Creek	20,000
South Meadow Creek	12,000
Pony, South Willow Creek	13,000
Red Lodge, Red Lodge Creek	4,900
Rock Creek, West Fork	2,200
Red Rock, Spring Branch	300
Roundup, Swimming Woman Creek	3,000
Springhill, Ross Creek	1,200
Stevensville, Cherette Creek	8,000
Sweet Grass, Deer Creek	800
Townsend, Confederate Creek	1,000
Crow Creek	1,250
Victor, Lake View	2,000
White Sulphur Springs, Battle Creek	6,000
Beaver Creek	9,000
Big Birch Creek	8,000
Big Spring Creek	7,000
Cammas Creek	6,500
Lake Creek	4,000
Musselshell River, North Fork	9,000
Newlan Creek	6,000
Smith River, South Fork	9,000
White Tail Creek	6,500
Winston, Antelope Creek	1,000
Staback Creek	1,000
Nebraska:	
Chadron, Beaver Creek	800
Big Bordeaux Creek	1,200
Chadron Creek	800
Dead Horse Creek	800
East Ash Creek	3,750
Indian Creek	4,550
Little Bordeaux Creek	800
Trunk Bute Creek	800
Gordon, Larabie Creek	1,500
Larver Creek	1,500
White Clay Creek	4,750
Rushville, White Clay Creek	4,750
Nevada:	
Ely, Applicant	*50,000
Sparks, Rodeo Creek	1,500
Verdi, State fish commission	*150,000
New Hampshire:	
Bartlett, Saco River	†15,000
Bennington, Lake George	4,000
Spring Pond	4,000
Willard Pond	3,000
Bowman, Moore River	†12,000
Bristol, Brayley Brook	6,000
Cockermouth River	10,000
Dick Brown Brook	8,000
Pemegewassett River	10,000
Smith River	10,000
Ten Mile Brook	8,000
Campton, West Branch	3,000
Canaan, Barney Pond	20,000
Blodgett Pond	3,000
Clark Pond	3,000
Conrow Brook	3,000
Cummings Pond	4,000
Currier Brook	2,500
Davis Brook	1,000
Fairweather Brook	8,000
Ford Brook	2,000
Gulf Brook	3,000
Hames Brook	7,000
Hart Pond	4,000
Indian Brook	15,000
Kilton Brook	2,000
Kimball Brook	10,000
Moose Brook	2,000
Murray Brook	2,000
Orange Brook	16,000
Powers Brook	1,000
Sawyer Brook	2,000
Story Brook	1,000
Cherry Mountain, Isreal River	†9,000
Concord, Jordan Pond	1,000
One Stack Brook	2,500
Enfield, Lovejoy Brook	4,000
Fabyan, Abenaki Brook	†2,000
Ammonoosuc River	†18,000
Asquam Brook	†2,000
Black Brook	†3,000
Clay Brook	†2,000
Clinton Brook	†3,000
Crawford Brook	†4,000
Deception Brook	†2,000
Jefferson Brook	†3,000
Lake Anderson	†4,000
Lake Carolyn	†3,000
Mount Echo Brook	†3,000
Sebossis Brook	†3,000
Twin River	†3,000
Glen, Ellis River	†9,000
Glen Cliff, Funnell Brook	†3,000
Oliverian Brook	†3,000
Witcher Brook	†3,000
Gorham, Wild River	†18,000
Grafton, Sanders Brook	2,000
Greenfield, Alexander Brook	2,000
Cooper Brook	3,000
Hardy Brook	6,000
Harrington Brook	4,000

Distribution of fish and eggs, fiscal year 1917—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
New Hampshire—Continued.	
Greenfield, Hovey Brook	3,000
Jarlyn Branch	4,000
Lawn Brook	3,000
Newton Brook	3,000
Smith Brook	3,000
South Brook	2,000
Young Brook	2,000
Henniker, Aime Brook	10,000
Brown Brook	4,000
Hill, Borough Brook	200
Flanders Brook	5,000
Knox Brook	200
Rowell Brook	200
Woodward Pond	8,000
Keene, Granite Lake	8,000
Great Brook	5,000
White Brook	8,000
Lebanon, Chamberlain Brook	2,000
Great Brook	11,000
Hibbard Brook	9,000
Smith Brook	1,500
Smith Pond	14,000
Stoney Brook	12,000
Littleton, Glover's pond	†4,000
Manchester, Bog Brook	3,000
Cold Brook	10,000
Cold Stream Brook	6,000
Darrah Brook	4,000
Hodgedon Brook	15,000
Leach Brook	10,000
McQuestion Brook	2,000
Mill Stone Brook	2,000
Nigger Brook	1,000
Patten Brook	10,000
Peters Brook	300
Pierce Brook	24,000
Ray Brook	2,200
Searches Brook	6,000
South Weare Brook	8,000
Stark Brook	15,000
Sweet Water Brook	2,000
Thompson Brook	2,000
Whiting Brook	11,000
Willys Brook	2,000
Woodward Brook	10,000
Nashua, Bailey Brook	6,000
Bartemus Brook	6,000
Beaver Brook	2,000
Budro Brook	10,000
Crystal Spring Brook	4,000
Glover Brook	1,500
Hardy Brook	2,000
Lid Reed Brook	8,000
Little Nesenkeag Brook	2,000
Muddy Brook	4,000
Naticook Brook	8,000
Nesenkeag Brook	10,000
Noyes's pond	8,000
Peacock Brook	4,000
Peg Leg Brook	5,000
Stearns Brook	1,500
Witch Brook	8,000
Newport, Rand Pond	1,000
Shedd Brook	2,000
Stony Brook	8,000
North Woodstock, Eastman Brook	3,000
Jackman Brook	2,000
Lost River	2,000
Pemigewasset River, Middle Branch	2,000
Plymouth, Clay Brook	8,000
Power's brook	8,000
South Brookline, Rockwood Pond	4,000
South Lyndeboro, Rose Mountain Brook	3,000
Suncook, Deer Brook	3,000
Hampshire Creek	3,000
Twin Mountain, Zealand River	†9,000
Warren, State fish commission	*50,000
New Hampshire—Continued.	
West Rindge, Taggart Brook	6,000
Wilton, Blood Brook	4,000
Hodgon Brook	4,000
Wing Road, Gale River	†12,000
Woodstock, Eastman Brook	6,000
New Jersey:	
Englewood, Ditman's pond	800
East Northvale Brook	500
Hutchinson Pond	500
Leonia, Egli's pond	500
Oak Ridge, Stony Brook	750
Stony Brook Lake	2,000
Paterson, Saw Mill Brook	2,000
Phillipsburg, Lows Hollow Creek	1,000
Mill Brook	1,000
Rockaway, Beaver Brook	2,400
New Mexico:	
Cloudcroft, Water Canyon Creek	1,500
Dexter, Pecos River	1,000
Espanola, Quemado Creek	1,000
Rio Amadia	1,000
Santa Clara River	1,000
Truckas Creek	1,000
Folsom, Canyon Creek	1,500
Glorieta, Holy Ghost Creek	5,000
Macho Creek	2,000
Moro Creek	3,500
Pecos River	9,000
Willow Creek	1,000
Winsor Creek	2,500
Hagerman, Felix River	500
Lamy, Pecos River	7,500
Las Vegas, Gallinas River	6,000
Gallinas River, South Fork	2,000
Gallinas River, Trout Spring Branch	1,000
Gallinas River, Youngs Fork	1,000
Sapello River	1,000
Raton, East Royale River	7,000
Schwachkeim Creek, Left Fork	2,500
Schwachleinge Creek, Right Fork	2,500
Sugarite Creek	5,000
Riberia, Pecos River	5,000
Taiban, Taiban Creek	500
New York:	
Altmar, Campbell Creek	†4,000
Grindstone Creek	†28,000
Podunk Creek	†5,000
Ardsley, Grassy Sprain Brook	†4,000
Sprain Brook	†8,000
Attica, Holden Brook	†4,000
Java Center Creek	†3,000
Johnson Creek	†2,000
Au Sable Forks, Taylor Pond	†8,000
Bath, Cold Spring Creek	†5,000
Benson Mines, Ellis Creek	†5,000
Little River	†15,000
Tamarack Creek	†5,000
Brookhaven, Little Neck Run	†1,750
Cadosia, Vance Creek	1,000
Callicoon, Callicoon Creek	†9,000
Cambridge, McMillans Brook	†3,000
Carthage, Black Creek	†12,000
Deerlick Creek	†3,000
Draper Creek	†3,000
Hubbard Creek	†5,000
Weaver Creek	†5,000
White Creek	†3,000
Catskill, Whip-poor-will Brook	†3,000
Cattaraugus, Boardman Creek	†3,000
Wallace Brook	†4,000
Cobleskill, Adams Hollow Brook	†10,000
Charlotteville Creek	2,000
Clapper Hollow Brook	†8,000
Cold Spring Brook	1,500
East Worcester Creek	†12,000
Tar Hollow Brook	1,000
Conewango, Post Brook	†5,000

Distribution of fish and eggs, fiscal year 1917—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
New York—Continued.	
Corning, Owens Pond	†4,000
Cortland, Fall Brook	5,000
Scott Brook	4,000
Croghan, Fish Creek	†10,000
Sand Pond	†10,000
Trout Brook	†5,000
Delevan, Worden's pond	†4,000
Deposit, Cold Spring Brook	1,000
Columbia Lake	2,000
Oquaga Creek	2,000
Rood Creek	1,000
Trout Creek	1,000
Whitaker Creek	500
East Worcester, Baptist Church Brook	†6,000
Clapper Hollow Brook	†5,000
Tar Hollow Brook	†6,000
Ellenville, Beer Kill Creek	†9,000
Botsford Brook	†5,000
Elmira, Barfield Brook	†8,000
Beaver Brook	†4,000
Catherine Creek	†8,000
Jackson Creek	†8,000
Seeley Creek	†5,000
Sing Sing Creek	†8,000
Wyncoop Creek	†8,000
Felts Mills, Felts Mill Creek	†10,000
Fulton, Black Creek	†16,000
Sheldons Creek	†5,000
Genoa, Gamel Creek	1,600
Pine Hollow Creek	800
Great Bend, Hubbard Creek	†15,000
Halfway, Carpenter Brook	†10,000
Hornell, Car Valley Brook	†5,000
Rockwell Brook	†5,000
Seely Creek	†10,000
Hunter, Batavia Kill Creek	†8,000
Big Hollow Creek	†8,000
Nauvoo Creek	†6,000
LaFargeville, Landon Creek	†4,000
Lake Mahopec, Croton River, West Branch	†21,000
Liberty, Mongaup Creek	1,000
Limestone, Quaker Creek	3,000
Long Lake West, Otter Pond	†5,000
Lyons, Ackerman Brook	1,200
Glenmont Brook	1,200
Mudge Creek	1,600
Rose Creek	1,200
Morrisville, Cowasselon Run	†3,500
Oneida Creek	†3,500
Mount Kisco, Beaverdam Creek	†17,500
Newark, Trout Creek	†15,000
North Ilion, Gulf Creek	†18,000
North Lansing, Gulf Creek	800
Teeter Creek	400
Northville, Charley Lake	†5,000
Oneonta, Charlotte River	†20,000
Oswego, Lewis Creek	†10,000
Port Henry, Cheney Pond	†10,000
Sand Pond	†5,000
Port Jervis, Black Brook	†5,000
Burnt Hope Creek	†6,000
Bush Kill Creek	†6,000
Mongaup River	†10,000
Shinglekill Creek	†8,000
Stenneykill Creek	†4,000
Potsdam, Snell Brook	†10,000
Preble, Tioughioga River	1,000
Randolph, Prosser Pond	†7,000
Raquette Lake, Applicant	*25,000
Bear Pond	*25,000
Richland, Mad River, West Branch	†10,000
Salmon River, North Branch	†13,000
Rome, Fish Creek	†27,000
	2,800
Mohawk River	3,200
Santa Clara, Deep Pond	†2,000
Deer Pond	†2,000
Dimmerick Brook	†4,000
New York—Continued.	
Santa Clara, Guide Board Brook	†5,000
Spring Pond	†2,000
Schenectady, Hungerkill Creek	†9,000
Schenevus, Elk Creek	†15,000
Sherburne, Handsome Brook	†20,000
Smyrna Brook	1,200
Shohola, Beaver Brook	†10,000
South Lansing, East Teeter Creek	†6,000
Steinberg Creek	1,600
Springville, Clarks Brook	†4,000
Syracuse, Butternut Creek	1,200
Chittenango Creek	1,600
DeMont Frida Brook	†5,000
Evansward Trout Pond	†5,000
Limestone Creek	1,200
Onondaga Creek	1,200
Pooles Brook	1,600
Scriba Creek	2,000
Walton, Beers Brook	†13,500
Bramley Brook	†5,000
East Brook	†9,000
Marvin Hollow Creek	†9,000
West Brook	†13,500
Watertown, Stebbins Creek	†15,000
Westport, Birch Pond	500
Bouquet River	500
Bouquet River, North Branch	500
Bouquet River, South Branch	500
Branch Brook, South Fork	500
Club House Brook	500
Cold Spring Brook	500
Courtney Pond	500
Deep Hole Pond	500
Finch Pond	500
Finch Pond Brook	500
Ledge Brook	500
Lindsay Brook	500
Miller Camp Brook	500
Moss Pond	1,500
Moss Pond Brook	500
Schroon River	500
Secret Pond	500
White Plains, Fowler Pond	300
North Carolina:	
Andrews, Morris Creek	2,000
Asheville, Dillingham Creek	2,500
Bowie, Cauchee Creek	3,000
Brevard, Hubbard Creek	4,000
Williamson Creek	8,000
Cherryfield, Bear Wallow Creek	3,000
Cherryfield Creek	3,000
Mill Creek	3,000
Paxton Creek	3,000
Doughton, Sandy Creek	3,000
Edgemont, Wilson Creek	5,000
Elkland, Greens Mill Creek	1,500
Hartley Creek	1,500
Howards Creek	2,000
Flat Rock, Kings Creek	2,000
Graphiteville, Mill Creek	2,000
Lake Toxaway, Bear Wallow Creek	6,000
Chatooga River	10,000
Fowler Creek	4,000
Green Creek	4,000
Miller's pond	4,000
Thompson Lake	4,000
Lenoir, Davenport Branch	2,000
Linville, Big Grassy Creek	5,000
Grandmother Creek	10,000
Laurel Creek	5,000
Linville River	5,000
Linville River, West Fork	5,000
Little Grassy Creek	4,000
Marion, Little Buck Creek	2,000
Mount Mitchell, Crab Tree Creek	300
Old Fort, Curtis Creek	5,000
Jarrett Creek	2,000
Mackey Creek	2,000
Swannanoa River	2,000

Distribution of fish and eggs, fiscal year 1917—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
North Carolina—Continued.	
Olivette, Mulberry Creek	2,000
Pineola, Barrier Creek	450
Cranberry Creek	200
Linville River	975
Pisgah Forest, Davidson River and tributaries	42,000
Rosman, Bear Wallow Creek	2,000
Bowen Works Creek	3,000
Bowing Creek	5,000
East Fork Creek	6,000
French Broad River, East Fork	6,000
French Broad River, Middle Fork	5,000
Gabbies Branch	2,000
Walkers Creek	3,000
Saluda, Fall Creek	1,000
Selica, Cantrell Creek	4,000
Shulls Mills, Boone Fork Creek	15,000
Watauga River	8,000
West Jefferson, Peak Creek	2,000
Prather Creek	2,000
Ohio:	
Akron, Cuyahoga River	†9,000
Cuyahoga River, tributaries of	†3,000
Little Cuyahoga River	†6,000
Madison, Grand River	†20,000
Paden City, Klays Creek	†20,000
Urbana, Cedar Creek	†10,000
Youngstown, Mill Creek	†15,000
Oregon:	
Clackamas, Molalla Creek	32,000
Liberal, Molalla River	15,000
Molina, Mill Creek	20,000
Noti, Long Tom River	5,000
Pennsylvania:	
Altoona, Blair Creek	20,000
Ashland, Dyers Run	500
Roaring Creek	1,000
Boiling Springs, Boiling Springs Pond	1,500
Bradford, Chapple Fork Run	1,200
Quaker Run	1,200
Sugar Run	1,200
Tuna Creek, East Branch	1,200
Tuna Creek, West Branch	1,200
Willow Creek	1,200
Canton, Biddle Creek	†2,000
Braham Creek	†2,000
Coons Creek	†2,000
Fellows Creek	†2,000
Little Schrader Creek	†2,000
Lye Run	†2,000
Lye Run, West Branch	†2,000
Mill Creek	†2,000
Pine Swamp Run	†2,000
Rathbone Creek	†2,000
Rock Run	†2,000
Schrader Creek	†2,000
South Creek	†2,000
Spring Brook	†2,000
Sugarworks Run, East Branch	†2,000
Sugarworks Run, West Branch	†2,000
Taber Creek	†2,000
Tioga River	†2,000
Towanda Creek	†2,000
Watkins Creek	†2,000
Whitehead Creek	†2,000
Williams Hollow Creek	†2,000
Wilson Creek	†2,000
Carlisle, Yellow Breeches Creek	1,500
Cedar Hollow, Valley Creek	1,200
Valley Creek, South Branch	1,200
Chambersburg, Caledonia Creek	5,500
Carbaugh Run	4,000
Furnace Dam	3,000
Pine Run	5,500
Raccoon Creek	3,500
Sanatarium Lake	1,000
Solenberger Lake	2,500
Solenberger Run	1,500
Pennsylvania—Continued.	
Cherry Tree, Brush Run	600
Chesterbrook, Valley Creek	1,200
Valley Creek, South Branch	1,200
Clarks Summit, Williams Creek	800
Clearfield, Albert Run	1,000
Alder Run	2,000
Anderson Creek	600
Baughman Run	1,000
Bear Wallow Run	1,000
Big Lick Run	3,000
Big Lick Run, Left Branch	1,000
Big Lick Run, Right Branch	1,000
Big Lick Run, Shaws Branch	1,000
Birch Run	2,000
Bish Run	1,000
Blooms Run	1,600
Bowman Run	1,000
Butler Run	1,000
Camppoke Run	2,000
Chase Run	1,000
Coal Creek	600
Coupler Run	2,300
Crooked Run	1,300
Debeck Run	1,000
Dixon Run	2,000
Doctor Fork Run	1,000
Downey Run	1,000
Eberts Run	1,000
Fork Run	3,300
Garden Draft Run	1,000
Gordon Run	1,000
Gum Swamp Run	1,000
Haines Run	1,000
Hampton Run	1,000
Haney Run	1,000
Horton Hollow Run	1,000
Irwin Run	1,000
Kephart Run	1,000
Kline Run	1,000
Laying Rock Run	1,000
Lick Run	4,600
Littel Run	1,000
Little Coupler Run	1,000
Little Montgomery Creek	3,000
Little Moose Creek	1,000
Little Stony Creek	300
Low Run	1,000
Mease Run	1,000
Merrits Run	1,000
Montgomery Creek	600
Moose Creek	2,600
Morgan Run	3,000
Ogden Run	1,000
Pine Hollow Run	1,000
Pine Swamp Run	1,000
Raccoon Run	2,000
Rattlesnake Run	1,000
Red Run	1,000
Reeds Run	1,000
Rock Run	1,000
Sam Reed Run	1,000
Sanborn Run	2,000
Sandy Run	1,000
Selfridge Run	1,000
Singletree Run	1,000
Spruce Island Run	1,000
Stone Run	2,600
Stone Hammer Run	1,000
Stone Quarry Run	1,000
Stony Battery Run	1,000
Stoneville Run	1,000
Stott Run	1,000
Surveyor Run	300
Tarkill Run	1,000
Thompson Read Run	1,000
Trout Run	600
Walker Run	1,000
Walnut Hollow Run	1,000
Whitney Run	2,600

Distribution of fish and eggs, fiscal year 1917—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Pennsylvania—Continued.	
Clearfield, Wilder Swamp Run	1,000
Wiser Run	1,000
Witch Hazel Run	1,000
Woods Run	2,300
Coudersport, Allegheny River, Headwaters	1,500
Chapel Run	500
Dingman Run	500
Dingman Run, East Branch	500
Dingman Run, West Branch	500
Kline Hollow Creek	500
Lehman Run	500
Mill Creek	1,000
Nelson Run	500
Nelson Run, East Branch	500
Reed Run	500
Reed Run, North Branch	500
Ruse Hollow Creek	500
Stone Crusher Hollow Creek	500
Swanson Run	500
Trout Run	500
Drums, Lehigh River	800
Dudley, Miller Run	1,500
East Mahoney, Lakewood Lake	1,500
Easton, Bushkill Creek	1,000
Ebensburg, Big Run	600
Cedar Run	600
Chest Creek	600
Clear Creek	600
Davis Creek	600
James Run	600
Jones Run	600
Laurel Lick Run	600
McBride Run	1,200
Moores Run	600
Morris Jones Creek	600
Nole Run	600
Roaring Run	600
Sheltig Run	600
Skellys Run	600
Smith Run	600
Spruce Creek	600
Tudor Run	600
Waters Run	600
Fairchance, Glendale Creek	1,000
Hayden Town Creek	1,000
Pine Run	1,000
Fallentimber, Beaverdam Creek	1,800
Franklin, Lyons Run	600
Patchel Run	1,000
Reed Run	1,000
Scott Run	1,000
Two Mile Run	1,200
Williams Run	1,000
Garden, Trout Creek	800
Valley Creek	1,200
Valley Creek, South Branch	1,200
Gillintown, Benner Run	1,000
Black Moshannon Creek	2,000
Gorton Run	1,000
Hicks Run	1,000
McKenney Run	1,000
Myers Run	1,000
Norton Run	1,000
Pine Run	1,000
Glen Iron, Bartley Run	500
Blue Run	500
Branch Run	1,000
Buffalo Creek	1,000
Furnace Gap Run	500
Laurel Run	1,000
Penns Creek	1,000
Sheasley Run	1,000
Spruce Run	500
Spitzer Run	500
Stony Run	500
Glen Union, Baker Run	2,400
Bear Pan Run	600
Pennsylvania—Continued.	
Glen Union, Benjamin Run	1,200
Clendening Run	1,200
Cold Fork Run	600
Crabapple Run	600
Cranberry Run	600
Phants Run	600
Rocky Fork Run	600
Shoemaker Run	1,200
Water Plug Run	600
Gouldsboro, Bell Meadow Creek	800
Lehigh River, Headwaters	1,200
Harrison Valley, Bloomers Run	500
Blue Coat Run	500
Byam Run	500
Clark Run	500
Clinton Run	500
Devens Creek	500
Dewight Creek	500
Glace Creek	500
Gordinier Run	500
Hammond Run	500
Hartwick Run	500
Janson Run	500
Kernan Run	500
Knickerbocker Run	500
Lent Hollow Run	500
Maundels Run	500
Moores Run	500
Pole Lick Run	500
Post Creek	500
Rock Run	500
School House Run	500
Turner Creek	500
Veley Run	500
Whites Run	500
Whitney Creek	500
Henderson, Gulph Creek	1,200
Howard, Laurel Run	1,000
Lucas Run	1,000
Howellville, Valley Creek	1,200
Valley Creek, South Branch	1,200
Hughesville, Beaver Run	3,000
Big Creek	3,000
Little Muncy Creek	3,000
Hulls, Sinnamahoning Creek, East Fork	1,500
Susquehanna River, East Fork	2,000
Hyner, Hyner Run	2,000
Right Fork Creek	1,800
Indiana, Fyock Run	1,200
Gilhourers Run	1,200
Jersey Shore, Rauch Run	2,400
Johnstown, Alwine Run	1,000
Kane, Buck Run	1,000
Fife Run	1,000
Kinzua Creek, South Branch	1,000
Lanigan Run	1,000
Mill Creek	1,200
Watermill Creek	1,200
Kato, Beech Creek	6,000
Panther Run	1,000
Sandy Run	3,000
Wolfe Creek	1,000
King of Prussia, Gulph Creek	800
Trout Creek	800
Lakewood, Potato Creek, Headwaters	1,500
Lees, Valley Creek	1,200
Valley Creek, South Branch	1,200
Lemont, Bear Meadow Gap Run	500
Cedar Creek	1,000
Centre Furnace Creek	500
Laurel Run	1,000
Mountain Creek	1,000
Roaring Run	1,000
Ross Farm Pond	500
Shingletown Gap Creek	500
Sinking Creek	1,000

Distribution of fish and eggs, fiscal year 1917—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Pennsylvania—Continued.	
Lemont, Slab Cabin Creek	1,000
Spring Creek	1,000
Spruce Creek	1,000
Stone Creek	1,000
Lewisburg, Beaver Run	1,500
Lewistown Junction, Alfarata Brook	600
Fishers Meadow Brook	600
McElhattan, Chatham Run	2,400
Lick Run	2,400
Mahaffey, Bear Run	600
Curry Run	1,200
Deer Run	600
Hazlett Run	600
Laurel Run	1,200
McCracken Run	600
Miller Run	600
North Run	600
Rogue Harbor Run	600
Saw Mill Run	1,200
Snyder Run	1,200
Whiskey Run	1,200
Malins, Valley Creek	1,200
Maple, Tout Creek	800
Mauch Chunk, Bear Creek	1,000
James Run	500
Mauch Chunk Creek	1,000
Mud Run	1,500
Meadville, Gilbert's pond	600
Mercersburg, Blue Spring Run	500
Church Hill Run	500
Deckey Run	1,000
Milford, Dingmans Creek	†8,000
Dwarfskill Creek	†8,000
Raymondskill Creek	†10,000
Sawkill Creek	†5,000
Vandermark Creek	†5,000
Mill Hall, Bull Run	300
Cedar Run	300
Cedar Spring Run	300
Cherry Run	300
Comadiner Run	†2,000
Cooper Run	†2,000
Duck Run	300
Fishing Creek	†20,000 600
Fox Hollow Run	300
Hinley Run	300
Little Fishing Creek	600
Long Run	†2,000
Lucas Run	†2,000
McElhatten Run	†3,000
Matter Run	†2,000
Muthler Run	300
Pepper Run	†2,000
Sand Spring Run	†2,000
Spring Run	†2,000
Spruce Run	†2,000
Mill Lane, Valley Creek	1,200
Minersville, Big Creek	600
Black Creek	600
Deep Creek	600
Indian Run	600
West Creek	600
New Bloomfield, Juniata River, tributary of	2,000
New Centerville, Tout Creek	800
Valley Creek	1,200
Newport, Big Spring Creek	1,200
Osceola Mills, Bear Run	2,000
Big Trout Run	2,000
Coal Run	2,000
Gearhart Run	1,000
Minnow Run	1,000
Mountain Branch	2,000
Twin Root Run	2,000
Orwigsburg, Shoener Run	2,000
Paddy Mountain, Penns Creek	6,000
Paoli Road, Valley Creek	1,200
Valley Creek, South Branch	1,200
Pennsylvania—Continued.	
Pen Argyl, Cherry Hollow Creek	500
Delabole Creek	1,000
Ross Valley Creek	1,000
Zigles Creek	1,000
Philipsburg, Alder Run	2,000
Ardel Run	1,000
Bailey Run	1,000
Barger Run	1,000
Barker Run	1,000
Bark Shed Run	1,000
Beaver Run	1,000
Benner Run	1,000
Bigelow Run	1,000
Big Spring Run	1,000
Bilger Run	1,000
Black Bear Run	3,000
Black Moshannon Creek	5,000
Butler Run	1,000
California Run	1,000
Carlin Run	1,000
Clover Run	1,000
Cold Creek	4,000
Cold Spring Run	1,000
Curry Run	1,000
Dayton Run	3,000
Deep Rock Run	3,000
Echo Run	1,000
Emigh Run	2,000
Flat Rock Run	1,000
Forge Run	1,000
Four Mile Run	1,000
Forshey Run	1,000
Hess Run	1,000
Hutton Run	1,000
Huzzard Run	1,000
Laurel Run	2,000
Little Beaver Run	1,000
Little Tom Run	1,000
Loop Run	1,000
McCord Run	1,000
Miller Run	1,000
Moravian Run	3,000
Morgan Run	1,000
Nason Run	1,000
North Run	1,000
One Mile Run	1,000
Patten Run	1,000
Pine Run	2,000
Rock Run	2,000
Seneca Run	2,000
Seven Spring Run	1,000
Shields Run	2,000
Six Mile Run	6,000
Slate Run	2,000
Sleepy Hollow Run	1,000
Smayes Run	1,000
Splash Run	1,000
Spruce Run	1,000
Sterling Run	2,000
Tomahawk Run	2,000
Tom Tit Run	1,000
Trout Run	2,000
Turtle Spring Run	2,000
Twig Run	1,000
Vail Run	1,000
Walker Run	1,000
White Stone Run	2,000
Winburne Run	1,000
Wolf Run	1,000
Pittsfield, Andrews Run	2,000
Barton Run	2,000
Plane Brook, Valley Creek	1,200
Port Allegany, Comes Creek	1,000
Fair Run	1,000
Hamilton Run	1,000
Rock Run	1,000
Skinner Creek, South Branch	1,000
Skinner Creek, West Branch	1,000
Port Matilda, Bear Run	1,000
Beaver Run	1,000

Distribution of fish and eggs, fiscal year 1917—Continued

BROOK TROUT—Continued.

Disposition.	Number.
Pennsylvania—Continued.	
Port Matilda, Brown Run	1,000
Coon Hollow Run	1,000
Flat Rock Creek	2,000
Hawk Run	1,000
McAllister Run	1,000
Meadow Creek	1,000
Milligan Hollow Run	1,000
Pine Run	1,000
Sandy Run	1,000
Sand Spring Run	1,000
Shirer Run	1,000
Six Mile Run	2,000
Spring Run	1,000
Spruce Run	1,000
Stony Creek	1,000
Tumbling Run	1,000
Preston Park, Potato Creek	1,000
Ralston, Abbot Run	2,000
Bear Run	2,000
Bear Trap Run	2,000
Bottle Run	2,000
Buck Run	2,000
Cold Run	2,000
Elk Lick Run	2,000
Frozen Run	2,000
Hawks Run	2,000
Heilman Run	2,000
Hounds Run	2,000
Long Run	2,000
Lycoming Creek	2,000
Mill Creek	2,000
Mill Run	2,000
Miners Run	2,000
Panther Run	2,000
Pleasant Creek	2,000
Potash Run	2,000
Red Run	2,000
Rock Run	2,000
Salt Run	2,000
Short Run	2,000
Wilhelm Run	2,000
Wolf Run	2,000
Yellow Dog Run	2,000
Renova, Baldwins Branch	600
Bull Run	600
Dark Hollow Creek	1,200
Green Lick Creek	1,200
Holly Branch	600
Lebo Branch	600
Lick Run	1,200
Lick Run, Left Fork	600
Little Green Lick Creek	600
Lorililly Creek	600
McCraney Run	600
Oleona Creek	600
Pump Station Creek	600
Seven Mile Run	600
Shingle Branch	1,200
Young Womans Creek, Left Fork	1,200
Young Womans Creek, Right Fork	1,200
Young Womans Creek, Summerson Fork	600
Richland, Krumstown Creek	500
Millards Lake	500
Mill Creek	500
Roaring Springs, Beaver Creek	1,800
Three Spring Run	2,400
Smithfield, Piney Creek	1,000
Somerset, Ankney Run	400
Bare Rock Run	400
Beam Run	400
Brogh Run	400
Clear Run (A)	400
Clear Run (B)	400
Deeter Run	600
Jones Mill Run	400
Kooser Run	400
Laurel Hill Creek	600
Pennsylvania—Continued.	
Somerset, Lohr Run	400
North Fork Run	400
Shafer Run	400
Weimer Run	400
Stillwater, Fishing Creek	2,000
Stroudsburg, Little Bushkill Creek	1,200
Summerville, Piney Creek, branch of	600
Tamaqua, Clear Spring Run	1,000
Kestler Run	1,000
Tobyhanna, Tobyhanna Creek	1,200
Trout Run, Bear Run	†2,000
Blacks Creek	†2,000
	2,000
Block House Creek	†2,000
	2,000
Bunnell Run	†2,000
	2,000
English Run	†2,000
	2,000
Flooks Run	†2,000
	3,000
Four Mile Run	2,000
Little Pine Creek	†2,000
	2,000
Otter Run	†2,000
	2,000
Pack Horse Creek	†2,000
	2,000
Rock Run	†2,000
Smith Run	†2,000
	2,000
Texas Creek	†2,000
	2,000
Wolf Run	†2,000
	2,000
Troy, Brace Creek	4,000
Leonard Creek	3,000
Ulysses, Newton Creek	500
Uniontown, Glade Run	1,000
Mill Run	1,000
Quebec Run	1,000
Valley Store, Valley Creek	1,200
West Chester, Mattock Run	1,000
Whiteland, Ashbridges Creek	1,000
Whiteland Creek	500
Wilkes-Barre, Bowman Creek	2,500
Williamsport, Big Bear Creek	4,000
Carter Run	3,000
Days Run	4,000
Hoagland Run, North Branch	3,000
Laurel Valley Run	3,000
Plunkett Creek	4,000
Shingle Branch	3,000
Spooner Run	3,000
Wolf Run	4,000
Windber, Beaver Run	600
Beaverdam Creek	600
Berkebile Run	600
Berkey Run	600
Biscuit Spring Run	600
Bowser Spring Run	600
Clear Shade Creek	600
Cub Run	1,200
Dark Shade Creek	600
Gloss Run	600
Laurel Run	600
Layton Run	600
Little Dark Shade Creek	600
Miller Run	600
Moores Run	600
Oldham Run	600
Otter Run	600
Piney Run	600
Roaring Fork Creek	1,800
Sandy Run	600
Shade Creek	1,800
Shingle Run	600
Wentz Run	600
Whitiker Run	600

Distribution of fish and eggs, fiscal year 1917—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Rhode Island: Georgiaville, Harris's pond	†2,000
South Carolina:	
Walhalla, Bare Branch	1,000
Colies Creek	1,500
Hamet Creek	1,000
Mills Creek	1,000
Whitewater River	2,500
South Dakota:	
Buffalo Gap, Beaver Creek	1,500
Deadwood, Two Bit Creek	4,000
Dumont, Rapid Creek	750
Elmore, Ice Box Canyon Creek	2,000
Raddick Gulch Creek	2,000
Spearfish Creek, Upper	4,000
Wild Cat Creek	2,000
Englewood, Bear Butte Creek	750
Bogus Jim Creek	750
Box Elder Creek	3,000
Corral Creek	750
East Fork, Spearfish Creek, Kill Daw Branch	1,500
Elk Creek	3,750
Elk Creek, branch of	1,500
Elk Creek, Halls Branch	1,500
Elk Creek, Hogan Branch	750
Elk Creek, West Branch	750
Este Creek	2,250
Hanna Creek	10,000
Hay Creek	6,000
Jim Creek	2,250
Keough Creek	5,000
Little Elk Creek	750
Lower Elk Creek	3,000
McCalls Creek	1,000
Middle Box Elder Creek	10,750
Middle Elk Creek	2,250
North Box Elder Creek	750
South Box Elder Creek	2,250
Spring Creek	4,750
Spruce Creek	1,750
Ward Creek	6,000
Upper Bear Butte Creek	1,500
Fairburn, Squaw Creek	1,500
Hermosa, Battle Creek	3,000
Squaw Creek	750
Hill City, Barthold Pond	750
Dell Creek	1,500
Horse Creek	1,500
Spring Creek	5,250
Spring Creek, Newtons Fork	3,000
Upper Spring Creek	2,250
Hot Springs, Fall River	1,500
Upper Beaver Creek	1,500
Wind Cave Creek	4,500
Iron Creek, Iron Creek	9,216
Martin, Bear-runs-in-the-lodge Creek	3,000
Little White River	3,000
Nahant, Little Rapid Creek, West Branch	1,500
Rapid Creek	1,500
Silver Creek	1,500
Spring Creek	750
Tilson Creek	1,500
Piedmont, Little Elk Creek	1,500
Pine Ridge, Wolf Creek	1,500
Wounded Knee Creek	3,000
Porcupine, Wounded Knee Creek	5,500
Pringle, Beaver Creek	2,000
Rapid City, Antlers Lake	1,500
Bogus Jim Creek	1,500
Boland Creek Pond	750
Box Elder Creek	1,500
Canyon Lake	750
Castle Creek	1,500
City Spring Pond	750
Cleghorn Spring Lake	750
Cottonwood Lake	1,500
South Dakota—Continued.	
Rapid City, Dark Spring Lake	750
Deer Creek	1,500
Fair Ground Lake	1,500
Halley Lake	1,500
Indian School Lake	2,250
Jim Creek	1,500
Keenan Pond	750
Lime Creek	1,500
Lime Kiln Creek	750
Little Rapid Creek	3,750
Lockhart Pond	750
Long Pond	750
Murphy Pond	750
Nugget Creek	1,500
Power Lake	750
Prairie Creek	1,500
Round Pond	750
Schamber Pond	750
Scott Pond	750
Sickler Pond	750
Slate Creek	2,250
Spayde Pond	750
Spring Creek	2,250
Superior Run	1,500
Tittle Spring Lake	1,500
Tunnell Creek	1,500
Victoria Creek	1,500
Rochford, Gimlet Creek	1,500
Little Rapid Creek	2,250
Rapid Creek	2,250
Silver Creek	750
Savoy, Beaver Creek	7,717
Little Spearfish Creek	25,717
Log Cabin Creek	10,000
South Dakota Fish Pond	5,000
Spearfish Creek	3,000
Spearfish, Beaver Creek	18,000
Bill Cook Branch	4,000
Bridal Veil River	6,000
Camp No. 2 Lakes	10,000
Chicken Creek	8,000
City Creek	4,000
Coxes Lake	15,000
Crago Branch	4,000
Crow Creek	10,000
Crow Creek, Authier Branch	5,000
Dedrich Spring Branch	5,000
Ernest Spring Branch	6,000
Farmer Jones Creek	5,000
Hemlock Spring Branch	3,000
Henwood Branch	3,000
Higgins Creek	15,000
Hilton Gulch Creek	10,000
Lake Branch	3,000
La Plant Branch	2,000
Lindley Spring Branch	4,000
Little Ranch Creek	8,000
Lower Redwater River	5,000
McCoffin Creek	8,000
McGregors Branch	7,000
McVey Spring Branch	3,000
Mill Branch	3,000
Mardens Spring Branch	8,000
Mountain Meadow Creek	12,000
Oak Spring Branch	3,000
Owens Creek	3,000
Park Spring Branch	3,000
Pettigrew Branch	3,000
Power Dam Lake	3,000
Rapid Spring Branch	2,000
River View Branch	5,000
Schmidt Branch	4,000
Smith Spring Branch	5,000
Spearfish Creek	53,500
Spring Brook	2,000
Spring Creek	13,000

Distribution of fish and eggs, fiscal year 1917—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
South Dakota—Continued.	
Spearfish, Spring Draw Creek	10,000
Stucco Mill Branch	4,000
Toomey Branch	6,000
Toomey Lake	8,000
Town Creek Branch	2,000
Weare Branch	5,000
Wildcat Creek	5,000
Sturgis, Bear Butte Creek	7,500
Deadman Creek	2,500
Tilford, Morse Creek	1,500
Valentine, Rosebud Creek	1,500
Schweigman Creek	1,000
Tennessee:	
Bristol, Big Creek	1,000
Elkmont, Jakes Creek	4,000
Little River	2,000
Erwin, Coffee Ridge Creek	2,000
Spring Branch	750
Garbers, Cherokee Creek	500
Ramsey Creek	500
Unicoi, Clear Fork Creek	250
Wonderland Park, Laurel Creek	2,000
Vermont:	
Arlington, Battenkill River	51
Beaver Brook	†5,000
Benedict Brook	†5,000 52
Butternut Gutter Brook	†2,000
Cole Brook	†5,000 51
Deming Brook	52
Fayville Brook	51
Reed Brook	†2,000
Roaring Branch	51
Roaring Branch, South Fork	†5,000 51
Warm Brook	51
Barnet, Aiken Brook	†5,000
East Peacham Brook	†10,000
Harvey Brook	†5,000 1,000
Roy Brook	1,000
Sucker Brook	†8,000
Barre, Daune Wood Brook	†1,000
La Fayette Brook	†3,000
Martin Brook	†3,000
Towne Brook	†3,000
Bennington, Barber Pond	300
Bickford Hollow Brook	300
Big Hell Hollow Brook	†5,000 200
Brown Brook	†5,000 200
Bushnell Brook	†3,000 200
Chapel Brook	200
Chase Brooks	†7,000 200
Dewey Brook	†4,000 200
Dunville Brook	300
Evens Brook	†2,000
Furnace Brook	300
Glastonbury Brook	300
Ladd Brook	200
Little Hell Hollow Brook	†4,000
Perry Thompson Brook	†5,000
Rider Brook	†4,000 200
Rockwood Brook	†5,000 200
South Brook	300
Stratton Brook	†3,000
Sucker Pond	300
Walloomsac River	300
Waters Brook	†3,000
Woodford Big Pond	300
Woodford City Brook	200
Vermont—Continued.	
Bolton, Beaver Meadow Brook	†5,000
Haney Hollow Brook	†5,000
Jones Brook	†7,000
Turk Brook	†3,000
Bradford, Maplewood Brook	†13,000
Braintree, Thresher Brook	†3,000
Brattleboro, Ames Hill Brook	1,000
Barber Brook	1,000
Bartlett Brook	†1,000
Bingham Brook	1,000
Blanchard Brook	†2,000
Bonnyvale Brook	1,000
Broad Brook	1,000
Brown Brook	1,000
Bruce Brook	1,000
Bullock Brook	†2,000
Burdict Brook	†2,000
Carl Sargent Brook	†1,000
Chamberlain Brook	1,000
Church Hollow Brook	1,000
Cold Brook	†2,000
Crosier Brook	†1,000
Dean Brook	1,000
Deer Park Brook	1,000
Dry Brook	†2,000
Edson Akley Brook	1,000
Ellenwood Brook	†2,000
Flagg Brook	†1,000
Franklin Brook	†1,000
Glidden Brook	1,000
Goodenough Brook	†1,500
Green River	1,000
Halladay Brook	1,000
Herrick Brook	†1,000
Higley Branch	1,000
Hinesburg Brook	1,000
Houghton Brook	†2,000
Houghton Meadow Brook	1,000
Hunter Brook	1,000
Israel Wood Brook	1,000
Jacobs Brook	†2,000
Jenks Brook	†2,000
Johnson Brook	1,000
King Charter Brook	1,000
Lynde Brook	†2,000
Marlboro Branch	1,000
Meadow Brook	1,000
Niles Brook	†2,000
Reed Brook	1,000
Roaring Brook	1,000
Rock River	1,000
Rock River Branch	1,000
Rock River, North Branch	1,000
Rudd Brook	†4,000
Sam Sargent Brook	†1,000
Slate Rock Pond	1,000
Smith Brook	†2,000
South Newfane Brook	1,000
Thayer Brook	†2,000
Tinker Brook	†2,000
Vick Warren Brook	†2,000
Wait Brook	†8,000
Ward Brook	†2,500
West Dummerston Brook	1,000
Williams Brook	†1,000
Winchester Brook	†1,000
Wrisley Brook	1,000
Bristol, Baldwin Brook	†3,000
Durfee Brook	†1,000
Hewitt Brook	†1,000
Norton Brook	†2,000
Paine Brook	†1,000
Cambridge, Ellsworth Brook	†3,000
Hutchins Brook	†3,000
McGuire Brook	†5,000
Macumber Brook	†3,000
Mansfield Brook	†3,000
Redmond Brook	†4,000
Reynolds River	†4,000

Distribution of fish and eggs, fiscal year 1917—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Vermont—Continued.	
Cambridge, Waugh Brook	†3,000
Waugh Brook, East Branch	†3,000
Canaan, Big Averill Brook	500
Big Averill Lake	1,000
Black Branch (First)	250
Black Branch (Second)	500
Forest Lake	1,000
Roaring Brook	250
Yellow Branch	500
Center, Larabee Brook	†3,000
Chester, Chester Pond	†5,000
Cuttingsville, Beaver Meadow Brook	†3,000
Crocker Brook	†3,000
Danville, Hartshorn Brook	†2,000
Sucker Brook	†3,000
East Dorset, Battenkill River	†25,000
Mad Tom Brook	†5,000
Otter Creek	†3,000
East Hardwick, Bell Brook	†2,500
East Ryegate, Creamery Brook	†4,000
Moore Brook	†3,000
Ely, Bannock Brook	1,500
Enosburg Falls, Cold Hollow Brook	†3,500
Ladd Trout Brook	†2,500
Mineral Spring Brook	†2,500
StonevilleBrook	†2,500
Tyler Branch, Bakersfield Branch	†4,000
Greensboro Bend, East Greensboro Brook	†3,000
Lamoille River, Headwaters	†10,000
Stannard Brook	†4,000
Groton, Darling Pond	†50,000 5,000
Hardwick, Abutment Brook	†1,500
Bailey Brook	†2,500
Collier Brook	†2,500
Cooper Brook	†3,000
Currier Brook	†1,500
Eaton Brook	†2,500
High Trestle Brook	†3,000
Laundry Brook	†2,500
Norris Brook	†1,500
Paine Brook	†3,500
Porter Brook	†6,000
Holden, Barnard Brook	†5,000
Bassett Brook	†3,000
Billings Brook	200
Clovervale Brook	†6,000
Clovervale Brook, East Branch	†4,000
Coal Kiln Brook	†5,000
Coburn Brook	†5,000
East Brook	400
Elliott Brook	†5,000
Furnace Brook	†20,000
Furnace Brook, North Branch	†15,000 200
Furnace River, West Branch	†10,000
Hewitt Brook	200
Little Brook	200
Osgood Brook	200
Picnic Brook	200
Randall Brook	†5,000
Ripley Brook	200
Valley View Farm Brook	†6,000
Wardwell Brook	200
Hyde Park, Tyndal Pond	†7,500
Lake, Averill Brook	†4,000
Big Averill Lake	†4,000
Black Branch	†4,000
Coaticook River	†6,000
Cole Brook	†2,500
Forest Brook	†4,000
Little Averill Brook	†2,000
Little Averill Lake	†3,000
Morrill Brook	†6,000
Norton Lake	†5,500
Nulhegan River	†15,000
Lyndon, Hawkins Brook	†5,000
Sheldon Brook	†3,000
Vermont—Continued.	
Lyndonville, Dish Mill Brook	†10,000
Flowers Brook	†3,000
Keach Brook	†2,000
Line Brook	†3,000
Lunenburg, Cat Bow Pond	†4,000
McIndoe Falls, Chamberlain Brook	†3,000 200
Creamery Brook	200
Manchester Brook	200
Moore Brook	400
Symmes Pond	†5,000
Manchester, Battenkill River	†8,000
Cold Spring Brook	†3,000
Lathrop Brook	†3,000
Lye Brook	†4,000
Morris Brook	†3,000
Manchester Depot, Battenkill River, West Branch	†5,000
Marshfield, Beaver Pond	†5,000
Doctortown Brook	†5,000
Ezra Mears Brook	†2,500
Lamberton Brook	†2,500
Niggerhead Brook	†2,500
Middlebury, Dutton Brook	†5,000
Ingles Brook	†3,000
McDowell Brook	†3,000
Middlebury River	†8,000
Poor Farm Brook	†5,000
Ripton River	†4,000
Ripton River, North Branch	†5,000
Steam Mill Brook	†3,000
Middlesex, Long Brook	†5,000
Peirce Brook	1,000
Montpelier, Lairds Pond	500
Payne Brook	†3,000
Morrisville, Billings Brook	†6,000
Bugbee Brook	†1,500
Cooper Brook	†2,000
Darling Brook	†2,000
Green River	†4,500
Hazen Brook	†2,000
McNall Brook	†4,000
Potash Brook	†2,500
Ryder Brook	†4,500
Smith Brook	†2,000
Upper Terrill Brook	†4,000
Newfane, Grassy Brook	1,000
New Haven Junction, Dike Brook	†3,000
Hubbard Brook	†3,000
Newport, Buck Brook (A)	†2,500
Buck Brook (B)	†3,500
Center Brook	†3,500
Day Brook	†3,500
Hatton Brook	†2,500
Holland Pond	†1,000
Jud Brook	†4,000
Kidder Pond	†1,000
Long Brook	†7,000
Orcutt Brook	†4,000
Papenaw Brook	†2,500
Tice Brook	†5,000
Turtle Pond	†6,000
Vailes Pond	†1,000
Ware Brook	†4,000
Watson Brook	†4,000
North Troy, Jay Branch	†5,000
Norton Mills, Nulhegan River, Black Branch	†12,500
Nulhegan River, East Branch	†14,500
Number Six Brook	†5,000
Roaring Brook	†2,000
Swanson Brook	†4,000
Yellow Branch	†6,000
Norwich, Lake Mitchell	†105,000 7,300
Orleans, Dewey Brook	†3,000
Gallup Brook	†6,000
Partin Brook	†3,000
Wyman Brook	†3,000

Distribution of fish and eggs, fiscal year 1917—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Vermont—Continued.	
Pittsford, Chittenden Pond	†15,000
Plainfield, Bancroft Pond	†3,000
Kingsbury Branch	†3,000
Pigeon Pond	†3,000
Slayton Brook	†3,000
Poultney, Endless Brook	†5,000
Hicks Brook	†3,000
Lewis Brook	†5,000
Morse Hollow Brook	†4,000
Poultney River	†15,000
Riley Brook	†5,000
Proctorsville, Williams River	†9,000 500
Randolph, Adams Brook	†4,000
Alco Pond	†5,000
Annis Brook	†3,000
Ayers Brook	†5,000
Bass Brook	†2,000
Bear Hill Brook	†3,000
Beedle's pond	†2,000
Blanchard Brook	†2,500
Bowman Brook	†3,000
Chandler Brook	†4,000
Clough Brook	†4,000
Cushman Brook	†3,000
Fishers Brook	†2,000
Guild Brook	†2,500
Gulf Brook	†3,000
Holman Brook	†3,000
Howard Hill Brook	†3,500
Mann Brook	†2,000
Meadow Brook	†3,500
Morse Brook	†1,500
Mud Pond	1,000
Poverty Lane Brook	†3,000
Roaring Brook (A)	†2,000
Roaring Brook (B)	†3,000
Roods Brook	†1,500
Soper Brook	†2,000
Spears Brook	†3,000
Thayer Brook	†3,000
Upper Ayers Brook	†2,500
Readsboro, Bailey Brook	600
Canedy Brook	600
Estey Brook	600
Olden Brook	600
West Branch	1,800
Rutland, Brewer Brook	†5,000
Britton Brook	†13,000
Castleton River	†8,000
Cold River	†6,000
Connors Brook	†3,000
Dawson Brook	†2,000
Dunklee Brook	†5,000
Glynn Brook	†4,000
Jim Blake Brook	†3,000
McDevitt Brook	†3,000
Moon Brook	†3,000
O'Brien Brook	†2,000
Paint Mine Brook	†3,000
Parker Brook	†3,000
Phillips Brook	†2,000
School House Brook	†3,000
Scott Brook	†4,000
Shrewsbury Pond	†2,000
Spring Brook	†3,000
Stewart Brook	†3,000
Sugar Hollow Brook	†10,000
Tenney Brook	†4,000
St. Albans, Miner Brook	†4,000
St. Johnsbury, Blodgett Brook	1,000
Chesterfield Brook	4,000
Hastings Brook	3,000
Hawkins Brook	6,500
Lawrence Pond (A)	2,000
Lawrence Pond (B)	1,500
Meadow Brook	200
Sleepers River	†70,709
Spaulding Brook	3,000
Vermont—Continued.	
St. Johnsbury, Walter Andric Brook	7,000
Wright Brook	2,000
Shaftsbury, Warm Brook	†5,000 80
Warm Brook, tributaries of	†2,000 80
South Londonderry, Farnum Brook	†7,000
High Bridge Brook	†3,000
Livermore Brook	†7,000
Mud Pond Brook	†5,000
Tannery Brook	†6,000
Winhall Hollow Brook	†5,000
South Ryegate, Bailey Pond	†5,000
Long Pond	†5,000
Scott Brook	†15,000
South Wallingford, Otter Creek	†10,000
Stowe, Gold Brook	†4,000
West Branch River	†8,000
West Hill Brook	†3,000
Sunderland, Battenkill River	150
Lathrop Brook	150
Sutton, Bailey Brook	†2,000
Bundy Brook	†3,000
Burnham Brook	†1,000
Butterfield Brook	†2,000
King Brook	180
Reed Brook	†1,500
Richards Brook	180
Sanborn Brook	†2,000
Twombly Brook	†1,500
Willard Brook	†2,000
Taftsville, Skunk Hollow Brook	300
Townshend, Eddy Brook	†4,000
Jay Brook	†4,000
Mill Brook	1,000
Peaked Mountain Brook	†4,000
Plumb Brook	†3,000
Wallingford, Otter Creek	†10,000
Waterbury, Hill Brook	†6,000
Liscom Guild Brook	†2,000
Little River	†5,000
Ricker Mountain Brook	†5,000
Shaw Brook	†3,000
Stevens Brook	†4,000
Swassey Brook	†4,000
Thatcher Brook	†10,000
Watts Brook	†5,000
Wheeler Brook	†2,500
West Burke, Bugbee Brook	†4,000
Cheney Brook	†2,500
Clark Brook	†10,000
Eaden Brook	†10,000
Jobs Pond Brook	†6,000 200
Legacy Brook	†2,000 180
Moulton Brook	†6,500 200
Page Brook	†3,000 200
School House Brook	†2,000 180
Townsend Brook	†3,000 200
West Dummerston, Baker Brook	†6,000
Black Mountain Brook	†3,000
Clay Pit Brook	†3,000
Walker Brook	†3,000
West Hartford, Dana Brook	1,500
Fales Pond	†5,000
Sunny Brook	200
West Pawlet, Indian River	†10,000 300
Windhall, Jamaica Pond	1,000
Woodstock, Beaver Meadow Brook	†2,000
English Mills Brook	†5,000
Fullerton Brook	†2,000
Gallup Brook	†3,000

Distribution of fish and eggs, fiscal year 1917—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Vermont—Continued.	
Woodstock, Gulf Brook	†5,000
Hedgehog Brook	†1,500
Kedron Brook	†8,000
Lakota Lake	500
Morgan Brook	†1,500
North Bridgewater Brook	†4,000
Ottaquechee River	†7,000
Prosper Brook	†7,000
Richardson Brook	†2,000
Smith Brook	†3,000
South Pomfret Brook	†5,000
White Brook	†3,000
Virginia:	
Arcadia, Jennings Creek	2,000
Jennings Creek, North Fork	2,000
Middle Creek	2,000
North Creek	2,000
Sprouts Run	2,000
Atkins, Nicks Run	3,400
Bedford, Otter River, Stony Fork	2,000
Big Island, Hunting Creek	8,000
Buena Vista, Enchanted Creek	2,000
Irish Creek	2,000
Pryors Cove Creek	2,000
Damascus, Park Branch	3,000
Edinburg, Laurel Run	1,600
Little Stony Creek	1,600
Elkton, Boones Run	2,400
Swift Run	3,000
Hardwood, Hayes Creek	1,000
Harrisonburg, Dry River	2,500
Hunter, Calvin Run	2,000
Little Difficult Run	1,600
Laurel Fork, Big Reed Island Creek	2,000
Mud Fork Creek	1,000
Stone Mountain Creek	2,000
Lexington, South Buffalo Creek	2,000
McGaheysville, Stony Run	1,500
Natural Bridge, Back Run	2,000
Elk Creek	3,000
Olinger, Thompson Creek	1,500
Riverside, Whites Run	2,000
Shenandoah, Pitt Spring Run	2,400
Staunton, Crab Run	2,400
Strasburg, Waites Run	2,400
Tazewell, Clear Fork Creek	2,000
Little Creek	2,000
Plum Creek	2,000
Roaring Fork Creek	2,000
Troutdale, Fox Creek	2,000
Laurel Creek	3,000
Waterlick, Dilbeck Run	1,600
Woodstock, Paddy Run	1,600
Peters Mill Run	1,600
Washington:	
Clarkston, Alpowa Creek	750
Du Pont, Lyons Lake	5,000
Everett, Applicant	*100,000
Republic, Sanpoil River	600
Springdale, Swamp Creek	450
Stevenson, Ena Lake	900
Equan-not Lake	900
Patsuk Lake	450
Shelipo Lake	675
Tohomish Lake	675
Tacoma, Waldes Rhue Lake	5,000
Vancouver, Cedar Creek	15,000
Salmon Creek	20,000
Whipple Creek	10,000
West Virginia:	
Albright, Cheat River	270
Elgies Run	1,600
Muddy Creek	720
Roaring Creek	900
Alexander, Beech Run	270
Birch Fork Creek	540
Flint Run	180
West Virginia—Continued.	
Alexander, Lower Dry Run	180
Margans Camp Run	180
Phillips Camp Run	180
Trout Run	180
Upper Dry Run	180
Beard, Locust Creek	800
Dobbin, Stony River Lake	2,000
Glady, Cheat River, Glady Fork	4,400
Hendricks, Otter Creek	1,600
Keyser, Cranes Nest Run	1,550
Eliber Spring Run	625
Jordan Run	800
Mill Run	500
Whips Gap Run	800
Kingwood, Ashpole Run	270
Buffalo Run	270
Littleton, Wolf Run	450
Manown, Morgans Run	800
Newlon, Buckhannon River, West Fork	3,200
Piedmont, Thompson Run	250
Raleigh, Fat Creek	800
Spangler, Hannah Run	450
Terra Alta, Joes Run	900
Salt Lick Creek	800
Wildell, Greenbrier River, West Prong	4,000
Wilsonia, Silcot Run	1,200
Winterburn, Greenbrier River	630
Wisconsin:	
Abbotsford, Eau Plain River	1,200
Adams, Duck Creek	668
Jackson Creek	800
Schoonover Creek	334
Alma, Bohris Valley Creek	1,200
Breams Valley Creek	1,200
Cooke Valley Creek	2,500
Friede Valley Creek	1,200
Johns Valley Creek	1,200
Little Waumandee Creek	1,200
Norwegian Valley Creek	2,500
Schaufs Valley Creek	1,200
Trout Valley Creek	2,500
Waumandee Creek	2,500
Arcadia, Big Beaver Creek	2,000
Bruce Creek	2,000
Elm Creek	2,000
Knutson Creek	1,000
Little Beaver Creek	1,000
Newcomb Creek	2,000
North Creek	2,000
Stony Brook	2,000
Vrall Creek	1,000
Ashland, Cedar Creek	2,000
Fish Creek	8,000
Pine Creek	5,000
Whittelsey Creek	3,000
Athens, Rib River	1,600
Bangor, Adams Valley Creek	1,200
Big Creek	800
Burns Creek	800
Dutch Creek	1,200
East Branch	800
Eynon Creek	800
Fish Creek	800
Kolkmans Creek	800
Little Fish Creek	800
Mosher Creek	400
Sand Creek	1,200
Whites Creek	800
Barneveld, Johnson Creek	400
Black River Falls, Allen Creek	400
Arnold Creek	400
Bacon Creek	400
Clear Creek	400
Dicky Creek	400
French Creek	400
Hoffman Creek	400

Distribution of fish and eggs, fiscal year 1917—Continued.

BROOK TROUT—Continued.

Disposition.	Number.	Disposition.	Number.
Wisconsin—Continued.		Wisconsin—Continued.	
Black River Falls, Kenyon Creek	400	Durand, Arkansaw Creek	500
Levis Creek	400	Arkansaw Creek, Middle Branch	500
Morrison Creek	400	Averill Creek	500
Perry Creek	400	Big Arkansaw Creek	500
Pine Creek	400	Cooley Creek	500
Ranch Creek	400	Duchane Creek	1,000
Roaring Creek	400	Fall Creek	500
Robinson Creek	400	Herron Creek	1,000
Silver Creek	400	Joe Gray Creek	500
Slosser Creek	400	Little Arkansaw Creek	500
Snow Creek	400	Little Missouri Creek	1,500
Squaw Creek	400	Little Plum Creek	500
Staunton Creek	400	Manion Creek	500
Tank Creek	400	Orlady Creek	500
Town Creek	400	Pattison Creek	1,000
Trout Creek	400	Ryder Creek	500
Van Hersett Creek	400	Schue Creek	1,000
Visno Creek	400	Spring Creek	1,000
Blair, Beaver Creek, North Branch	3,000	Eau Claire, Andrews Creek	800
Beaver Creek, South Branch	3,000	Annie Creek	800
Bloomer, McCanns Creek	3,200	Bessie Creek	400
Sand Creek	800	Brown Creek	400
Blue Mounds, Austin Creek	400	Clark Creek	400
Boley Creek	400	Culver Creek	800
Frame Creek	400	Dale Creek	400
Froli Creek	400	Evens Creek	800
McKinley Creek	400	Mildred Creek	800
Ruste Creek	400	Palmer Creek	800
Shea Creek	400	Sandy Creek	400
Topper Creek	400	Willow Creek	400
Bowler, Henning Creek	800	Edgerton, Anthony Spring Creek	334
Straussberg Creek	800	Badfish Creek	500
Brokaw, Silver Creek	2,000	Caledonia Spring Creek	167
Casco, Casco Creek	1,600	Greens Creek	167
Zickmund Run	800	Lynn Creek	335
Cashton, Aarnes Creek	600	Silver Creek	335
Hagen Creek	600	Eland, Eland Creek	1,600
Norbo Creek	600	Embarras River	800
Schriener Creek	600	Embarras River, branch of	400
Shannon Creek	600	Embarras River, Middle Branch	1,200
Cayuga, Bittner Creek	400	Eleva, Adams Creek	400
Cayuga Creek	400	Bennet Valley Creek	400
Earnest Creek	800	Big Creek (A)	400
Eight Mile Creek	400	Big Creek (B)	400
Iron River	800	Bolinger Creek	400
Lighter Creek	400	Chimney Rock Creek	400
Mill Creek	400	Fifteen Mile Creek	400
Mud Creek	400	Haaken Creek	400
Ore Creek	800	John Hoven Creek	400
Spring Creek	400	Lindsey Creek	400
Cylon, Hay Creek	400	McCurran Creek	400
Hutton Creek	800	Rosman Creek	400
Spring Brook	800	Sunum Creek	400
Willow River, South Fork	1,600	Toleffsen Creek	400
Danbury, Bangs Creek	1,500	Trout Creek	400
Darlington, Lovetts Branch	400	Elkhart Lake, Crystal Lake	800
Otter Creek	500	Mullet River	800
Deer Park, Willow River, South Fork	800	Mullet River, branch of	1,200
Delta, Spring Lake	5,000	Elkhorn, Spring Prairie Creek	1,134
Dodgeville, Blotz Creek	400	Fontana Spring Brook	334
Conley Creek	400	Whitewater Spring Creek	334
Cox Hollow Creek	400	Williams Bay Spring Creek	400
Flint Creek	400	Elk Mound, Mud Creek	3,200
Hendy Creek	400	Ellis Junction, Smith Creek	400
Jones Creek	400	Thunder River	1,200
Murphy Creek	400	Elmwood, Big Mosourie Creek	1,200
Rock Creek	334	Brush Creek	400
Wedlake Run	400	Cave Creek	800
Williams Creek	400	Mosourie Creek, South Fork	800
Willow Creek	400	Plum Creek, South Fork	1,200
Yager Creek	400	Fairchild, Graves Mill Creek	400
Donaldson, Muskrat Creek	668	Hanson Creek	400
Spring Creek	1,200	McLaren Creek	400
Swamp Creek	1,600	Marten Creek	400
Tamarack Creek	1,200	Mill Creek	400
Dunbar, Pike River, South Branch	1,600	Newman Creek	400
		Searls Creek	400

Distribution of fish and eggs, fiscal year 1917—Continued.

BROOK TROUT—Continued.

Disposition.	Number.	Disposition.	Number.
Wisconsin—Continued.		Wisconsin—Continued.	
Fairchild, Snake Creek	400	Independence, Russell Valley Creek	1,000
Tolles Creek	400	Ruste Creek	1,000
Travis Creek	400	Schaffner Creek	1,000
Fond du Lac, Camp Ground Creek	1,301	Simonson Valley Creek	1,000
Gans Creek	501	Skogstad Creek	1,000
Gillett Creek	400	Slanten Valley Creek	1,000
Hobbs Creek	400	Solfest Creek	1,000
Keys Creek	400	Traverse Valley Creek	1,000
Mulvey Creek	800	Ulberg Creek	1,000
Parsons Creek	1,301	Ute Creek	1,000
Phelps Creek	334	Van Tassel Creek	1,000
Rucks Creek	800	Veum Creek	1,000
Sheridan Creek	400	Walls Creek	1,000
Strook Creek	400	Warner Creek	1,000
Fountain City, American Creek	2,600	Zimmers Valley Creek	1,000
Cream Valley Creek	1,300	Iowa Falls, Elk Run Creek	2,000
Eagle Valley Creek	1,200	Kellogg, Snake Creek	3,600
Glencoe Creek	1,300	Kilbourn, Corning Creek	400
Johns Valley Creek	1,300	Gilmore Creek	400
Pipers Valley Creek	1,200	Gulch Creek	400
Foxboro, Empire Creek	1,500	Plainville Creek	1,200
Galesville, Beaver Creek, North Branch	1,800	La Crosse, Dutch Creek	1,600
Beaver Creek, South Branch	1,800	Eagle Creek	2,000
Dutch Creek	600	Halfway Creek	3,200
Frenches Creek	1,200	Sand Lake Cooley Creek	2,400
Silver Creek	600	Spring Cooley Creek	1,600
Tamarac Creek	1,800	State Road Cooley Creek	1,600
Glen Flora, Bear Creek	400	La Farge, Bear Creek	800
Deer Tail Creek	800	Manitowoc, Black Creek	1,200
Josie Creek	400	Branch River	1,200
Little Jump River	400	Cootway Creek	400
Main Creek, Middle Fork	800	Fisher Creek	400
Main Creek, South Fork	800	Francis Creek	400
Silver Creek	400	Kappelman Creek	800
Skinner Creek, North Fork	400	Kromfort Creek	400
Skinner Creek, South Fork	800	Point River	400
Gordon, Ox Creek	†5,000	Marengo, Bruinsweiler Creek	†7,000
Grand Rapids, Chester Creek	1,600	Cody Creek	†3,000
Harvey Creek	800	Forsythe Creek	†2,000
Seven Mile Creek	800	Marengo River	†5,000
Hancock, Little Roche a Cri Creek	1,200	Spring Creek	†4,000
Hatley, Plover River	2,672	Mauston, Big Creek	800
Hortonville, Black Otter Creek	800	Brewer Creek	800
Independence, Amundson Creek	500	Mile Creek	800
Bennett Creek	1,000	Smith Creek	400
Bjerkland Creek	500	Mellen, Beaver Creek	†3,000
Borst Valley Creek	1,000	Brown Creek	†4,000
Burnt Valley Creek	1,000	Camp 20 Creek	†3,000
Chimney Rock Creek	1,000	Cleveland Creek	†4,000
Cooks Creek	1,000	Dellean Creek	†5,000
Davis Creek	1,000	Erle Creek	†7,000
Davis Valley Creek	1,000	Fox Creek	†4,000
Dubiel Creek	1,000	Gravely Creek	†4,000
Engum Valley Creek	1,000	Happy Creek	†4,000
Faar Creek	1,000	Hard Scrabble Creek	†4,000
Fernright Creek	1,000	Kings Creek	†5,000
Filla Creek	1,000	McCarty Creek	†6,000
Grietz Creek	1,000	Mellen Creek	†3,000
Grunem Creek	1,000	Mink Creek	†4,000
Gunderson Valley Creke	1,000	Minnow Creek	†4,000
Hawkenson Creek	1,000	Mirror Creek	†5,000
Holman Creek	1,000	Rocky Run	†3,000
Hulberg Creek	1,000	Scott and Taylor Creek	†5,000
Hunts Valley Creek	1,000	Seipel Creek	†4,000
Husselgard Creek	1,000	Silver Creek	†4,000
Johnson Creek	1,000	Slow Shadow Creek	†5,000
Killness Creek	1,000	Stony Creek	†4,000
Kurth Creek	1,000	Trout Creek	†4,000
Lewis Creek	1,000	Willow Creek	†4,000
Lindon Creek	1,000	Menomonie, Adams Creek	1,103
Lygas Creek	1,000	Anderson Creek	1,103
Maloney Creek	1,000	Annis Creek	1,103
Nelson Valley Creek	1,000	Asylum Creek	1,103
North Branch	1,000	Big Beaver Creek	1,103
Plum Creek	1,000	Big Elk Creek	1,103
Popes Creek	1,000	Big Hay Creek	1,103
Roskos Creek	1,000	Big Meadow Creek	1,103
		Big Missouri Creek	1,103

Distribution of fish and eggs, fiscal year 1917—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Wisconsin—Continued.	
Menomonie, Big Otter Creek	1,103
Biss Creek	1,103
Blair Creek	1,103
Bolin Creek	1,103
Bubbling Spring Creek	1,103
Cady Creek	1,103
Campbell Creek	1,103
Clack Creek	1,103
Connor Creek	1,103
Coon Creek	1,103
Cranberry Creek	1,103
Crosby Creek	1,103
Dahl Creek	1,103
Drowley Creek	1,103
Dushane Creek	1,103
Eau Galle River	1,103
Eddy Creek	1,103
Eighteen Mile Creek	1,103
Enems Creek	1,103
Galloway Creek	1,103
Gilbert Creek	1,103
Hall Creek	1,103
Hay Creek	1,103
Hay River, North Fork	1,103
Hay River, South Fork	1,103
Hobbs Creek	1,103
Honey Creek	1,103
Iron Creek	1,103
Irving Creek	1,103
Jesse Creek	1,103
Johns Creek	1,103
Johnson Creek	1,103
King Creek	1,103
Knight Creek	1,103
Lamb Creek	1,103
Lindsay Creek	1,103
Little Beaver Creek	1,103
Little Elk Creek	1,103
Little Missouri Creek	1,103
Little Otter Creek	1,103
Little Sand Creek	1,103
Losby Run	1,103
Lower Pine Creek	1,103
Lynch Creek	1,103
McArthy Creek	1,103
Miller Creek	571
Mores Creek	1,103
Mud Creek	1,103
Mud Creek, East Fork	1,103
Mud Creek, North Fork	1,103
Owen Creek	1,103
Palmer Creek	571
Parker Creek	1 103
Popple Creek	1,103
Proper Creek	1,103
Quarder Creek	1,103
Quilling Creek	1,103
Rock Creek	1,103
Rush Creek	1,103
Sand Creek	1,103
Shafer Creek	1,103
Simonson Creek	1,103
Smith Creek	1,103
Spring Creek	1,103
Stoner Creek	1,103
Styer Creek	1,103
Thum Creek	1,103
Tiffany Creek	1,103
Torgerson Creek	1,103
Trout Creek	1,103
Upper Pine Creek	1,103
Valley View Creek	1,103
Vance Creek	1,103
Varney Creek	1,103
Washburn Creek	1,103
Watterson Creek	1,103
Wilson Creek	1,103
Wilson Creek, North Branch	1,103
Wisconsin—Continued.	
Menomonie, Wolf Creek	1,103
Merrill, McCloud Creek	800
Newood Creek	800
Pine Creek	800
Six Mile Creek	800
Millston, Ketchem Creek	800
Lambert Creek	800
Pigeon Creek	800
Robinson Creek	800
Rudd Creek	800
Mondovi, Armor Valley Creek	400
Bennett Valley Creek	400
Carroll Creek	400
Day Creek	400
Dillion Creek	400
Dover Creek	400
Dutch Creek	400
Fifteen Creek	400
Ford Creek	400
Harvey Creek	400
Hayes Creek	400
Merril Creek	400
Modera Creek	400
Rock Creek	400
Rosman Creek	400
Whelan Creek	400
White Creek	400
Monticello, Blum Creek	335
Carroll Creek	500
Loertscher Creek	334
Marty Creek	335
New Lisbon, Fountain Creek	800
Macomber Creek	1,200
Mead Creek	1,200
Northcott Creek	800
Webster Creek	800
Newry, Homstad Creek	600
Norwalk, Brunner Creek	334
Fairbanks Creek	1,200
Matis Creek	1,200
Richards Creek	1,200
Rockaman Creek	600
Schells Creek	600
Schlutman Creek	600
Slickman Creek	600
Spring Creek	600
Spring Valley Creek	1,200
Summit Creek	334
Traschel Creek	334
Oakfield, Camp Ground Creek	800
Willow Creek	800
Otis, Averill Creek	800
Hanson Creek	800
Johnson Creek	800
Johnson Creek, East Branch	800
Pat Smith Creek	800
Pine Creek	800
Pine Creek, North Branch	400
Prairie River	2,000
Willow Creek	800
Park Falls, Rapid Creek	1,200
Rock Creek	800
Sand Creek	400
Patzau, Empire Creek	7,500
Pembine, Boulder Creek	400
Mullony Creek	400
Pemene Creek	400
Silver Creek	734
Smith Creek	400
Trestle Creek	400
Pepin, Big Plum Creek	1,300
Bogus Creek	650
Little Plum Creek	650
Lost Creek	650
Porcupine Creek	650
Roaring River	1,300
Pewaukee, Spring Creek	500
Phelps, Twin Creek	334

Distribution of fish and eggs, fiscal year 1917—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Wisconsin—Continued.	
Plainfield, North Creek	1,600
Roche a Cri Creek	2,000
Ten Mile Creek	800
Readstown, Albert Johnson Creek	400
Black Bottom Creek	400
Boyle Creek	400
Clancy Creek	400
Day Creek	400
Flanagan Creek	400
Fortney Creek	400
Govier Creek	400
Halls Creek	400
Hanson Creek	400
Harrison Hollow Run	400
Herrid Creek	400
Jacobson Branch	400
Johnson Creek	400
Midthun Creek	400
Morse Creek	400
Munson Creek	400
Norwegian Hollow Run	400
Plum Creek	400
Reedsburg, Hay Creek	1,200
Twin Creek	1,800
Rhineland, Crescent Creek	800
Four Mile Creek	400
Jennie Creek	800
Noisy Creek	1,200
River Falls, Kinnickinnic River	4,800
Kinnickinnic River, Lower	1,200
Kinnickinnic River, Upper	2,400
Kinnickinnic River, West Branch	1,200
Salmo, Bark Creek	3,000
Brickyard Creek	3,000
Lost Creek	2,000
McDonald Creek	3,000
Onion River	3,000
Pikes Creek	3,000
Racket River	3,000
Ravine Park Creek	2,000
Redcliff Creek	3,000
Sand River	4,000
Siskiwit Creek	4,000
Sheboygan Falls, Otter Creek	400
Rhine Creek	2,000
Sparta, Ranch Creek	1,200
Spring Green, Jones Creek	400
Stone Lake, Hay Creek	2,000
Sissibagama Creek	2,400
Stoughton, Atkinson Creek	400
Superior, Miles Creek	†5,000
Upper Brule River	8,000
Tomah, Allen Creek	400
Bear Creek	400
Big Squaw Creek	400
Brandy Creek	400
Brush Creek	400
Coles Creek	400
Council Creek	400
Dead Creek	400
Deer Creek	400
Dixon Creek	400
Finger Creek	400
Indian Creek	400
Jennings Creek	400
La Flora Creek	400
Lemonweir Creek	400
Little Squaw Creek	400
Lowe Creek	400
Mill Creek	400
Mudd Creek	400
Sand Creek	400
Sandy Creek	800
Silver Creek	400
Sparta Creek	400
Stony Creek	400
Swamp Creek	400
Thompson Creek	400
Wisconsin—Continued.	
Tomahawk, Armstrong Creek	400
Bearskin River	800
Berry Creek	400
Big Pine Creek	400
Hay Creek	400
Keuhling Creek	400
Little Pine Creek	800
Pickerel Creek	400
Richie Creek	800
Spring Creek	400
Squaw Creek	400
Trout Creek	800
Trempealeau, American Valley Creek	1,200
Beaver Creek	3,800
Beaver Creek, North Branch	1,400
Church Valley Creek	1,200
Corrigans Creek	1,400
Corrigans Valley Creek	1,200
Crystal Creek	1,400
Dutch Creek	3,800
Ettrick Valley Creek	2,400
Fox Creek	2,400
French Creek	3,800
French Creek, North Branch	1,400
French Creek, South Branch	1,400
French Valley Creek	1,200
Holcomb Cooley Creek	1,200
Norway Valley Creek	1,200
Pine Creek	1,200
Tamarack Creek	1,200
Turtle Lake, Beaver Creek	1,200
Clayton Bridge Creek	400
Lightning Creek	800
Silver Creek	400
Smith Creek	400
Turtle Creek	800
Viroqua, Bad Ax River, North Fork	400
Be-A-Bout Creek	400
Bishop Creek	400
Brookville Creek	400
Browns Creek	400
Brush Hollow Creek	400
Carey Creek	800
Cedar Creek	400
Cheatham Creek	400
Connaway Creek	400
Cook Creek	400
Duck Egg Creek	400
Elk Creek	400
Getters Creek	400
Harrison Creek, North	800
Harrison Creek, South	400
Pine Hollow Creek	400
Purdy Creek	400
Reeds Creek	400
Rogers Creek	400
Sees Creek	400
Sidie Creek	400
Springville Creek	400
Taintor Creek	400
Willow Spring Creek	400
Waukesha, Baldwin Creek	400
Bickwell Creek	400
Blackwell Creek	400
Dopps Creek	400
Genesee Creek	400
Honeyager Creek	400
Keppens Creek	400
Rosenow Creek	800
Salesville Creek	400
Scuppernong Creek	400
Waterville Creek	400
Willow Creek	400
Waupaca, Radley Creek	2,000
Wausau, Big Sandy Creek	334
Black Creek	800
Bull Junior Creek	800
Cedar Creek	800

Distribution of fish and eggs, fiscal year 1917—Continued.

BROOK TROUT—Continued.

Disposition.	Number.
Wisconsin—Continued.	
Wausau, Four Mile Creek	2,000
Little Trap Run	334
Westby, Bad Ax River	400
Baglien Creek	400
Bargs Creek	400
Dahl Creek	400
Douse Creek	400
Dybing Creek	400
Ellefson Creek	400
Esofea Creek	600
Freming Creek	400
Hanson Creek	400
Helge Larson Creek	400
Helgeson Creek	400
Helseth Farm Creek	400
Hillside Creek	400
Hoilins Creek	400
Holte Creek	400
Jenson Creek	600
Langhus Creek	400
Larson Creek	800
Moller Creek	400
Oium Creek	400
Olson Creek	800
Overhagen Creek	1,200
Peterson Creek	400
Pierce Creek	400
Rentz Creek	400
Sandbakken Creek	400
Sease Creek	400
Senling Creek	400
Shannon Creek	600
Sherve Creek	400
Skersmoen Creek	400
Skough Creek	400
Spring Valley Creek	400
Stevenson Creek	600
Sveen Creek	400
Swenson Creek	400
Timber Coolee Creek	400
Tomten Creek	400
Von Ruden Creek	400
Whitehall, Adams Creek	1,000
Breed Creek	1,000
Caswell Creek	1,000
Freeman Creek	1,000
Harlow Creek	1,000
Hamden Creek	1,000
Hensel Creek	1,000
Kidder Creek	1,000
Libakken Creek	1,000
McKivergan Creek	1,000
Solsrud Creek	1,000
Taylor Creek	1,000
Webb Creek	1,000
Wells Creek	1,000
Wood Creek	1,000
Wilton, Billings Creek	600
Brush Creek	1,200
Cold Spring Creek	600
Cook Creek	1,200
Dorset Creek	600
Farmers Creek	600

Disposition.	Number.
Wisconsin—Continued.	
Wilton, Gallagher Creek	600
Kinney Valley Creek	600
Meyers Creek	600
Moores Creek	600
Posy Creek	600
Riordon Creek	600
Sibke Creek	600
Sinks Creek	600
Slayton Creek	600
Straightman Creek	600
Walge Creek	600
Webb Creek	600
Winneboujou, Blueberry Creek	1,000
Cusins Lake	1,000
Glozes Creek[a]	1,000
Hollbrook Creek	1,000
Lake Florence	†2,000
Little Brule River	†3,000
Sandy Pond	†1,000
Saunders Pond	†1,000
Stoney Pond	†1,000
Wheatons Creek	2,000
Winter, Allen Creek	400
Casey Creek	800
Deadmans Creek	800
Jennings Creek	400
Nap Stout Creek	400
Wyoming:	
Aladdin, Rocky Ford Creek	2,500
Beulah, Sand Creek	4,500
Silver Spring Branch	6,000
Cody, Anderson Creek	1,600
Shoshone River, South Fork	1,800
Lander, Bear Creek	5,000
Beaver Creek	7,500
Big Popo Agie River	10,000
Lander Creek	5,000
Rock Creek	7,500
Silas Creek	5,000
Slate Creek	5,000
Willow Creek	7,500
Laramie, Hunt's lake	*50,000
Manderson, East Tensleep Creek	1,600
Misty Moon Lake	800
Willow Creek	1,200
Newcastle, Stockade Beaver Creek	2,000
Powell, Bitter Creek	600
Canyon Creek	400
Lake Creek	400
Line Creek	600
Little Rocky Creek	600
Mae Wood Creek	400
Owens Creek	200
Paint Creek	600
Willow Creek	400
Sage, Twin Creek	1,050
Saratoga, Jack Creek	12,000
Lake Creek	33,000
Japan: Kobe, Japanese Government	*100,000
Total	*935,600 †5,972,495 7,868,932

SUNAPEE TROUT.

Disposition.	Number.
Vermont: Brattleboro, South Pond	†8,000

[a] Loss in transit, 6,000 fry; 900 fingerlings.

Distribution of fish and eggs, fiscal year 1917—Continued.

GRAYLING.

Disposition.	Number.
California: San Francisco, San Gregoria Creek	*50,000
Colorado:	
Antero, Antero Lake	†50,000
Leadville, Arkansas River	†15,000
Twin Lakes	†15,000
Loveland, Big Thompson River	†30,000
Michigan: Grayling, State fish commission	*50,000
Montana:	
Belt, Belt Creek	†16,000
Little Belt Creek	†16,000
Neil Creek	†8,000
Otter Creek	†16,000
Montana—Continued.	
Willow Creek	†8,000
Glacier Park, Grinnell Creek	†32,000
Middle Two Medicine Lake	†32,000
St. Marys Lake	†32,000
Madison Lake, Madison Lake	†500,000
Odell Creek, Odell Creek	†260,000
Sappington, Jefferson River	†24,000
Whitefish, Lacy Creek	†24,000
New York: New Milford, Basherkill River	*25,000
Total	*125,000 †1,078,000

SMELT.

Disposition.	Number.
Maine:	
Anson, Great Emden Pond	†4,000,000
Belfast, Quantobacook Lake	†4,000,000
Brooks, Randall Pond	†4,000,000
Denham, Branch Pond	†600,000
Otis, Green Lake	†7,400,000
Maine—Continued.	
Sullivan, Tunk Pond	†4,000,000
Waldo, Halfmoon and Mixer Ponds	†4,000,000
Total	†28,000,000

PIKE AND PICKEREL.[a]

Disposition.	Number.
Illinois:	
Dallas City, Lake Cooper	33
Galena, Mississippi River	8,100
Iowa:	
Bellevue, Mississippi River	8,900
Fairport, Mississippi River	205
North McGregor, Mississippi River	20,050
Minnesota:	
Homer, Mississippi River	10,762
Lake City, Lake Pepin	946
Minnesota—Continued.	
Richmond, Mississippi River	2,060
Winona, Mississippi River	3,070
Wisconsin:	
Fountain City, Mississippi River	12,485
Genoa, Mississippi River	5,000
La Crosse, Mississippi River	21,500
Trempealeau, Mississippi River	10,532
Total	103,643

FRESH-WATER DRUM.

Disposition.	Number.
Illinois: Galena, Mississippi River	1,200
Iowa:	
Bellevue, Mississippi River	1,875
Fairport, Mississippi River	529
Wisconsin:	
Fountain City, Mississippi River	200
Wisconsin—Continued.	
Genoa, Mississippi River	5,000
La Crosse, Mississippi River	20,000
Lynxville, Mississippi River	1,000
Total	29,804

CRAPPIE AND STRAWBERRY BASS.

Disposition.	Number.
Alabama:	
Anniston, Aquarium	35
Oxford Lake	70
Birmingham, City Aquarium	20
Dancy, Binion's pond	70
Montgomery, Shooting Club Lake	70
Opelika, Edwards's pond	70
Sulligent, Maddox's pond	35
Arizona:	
Douglas, Mulberry Pond	80
Globe, Roosevelt Lake	1,120
Arkansas:	
Black Rock, Black River	1,900
Conway, Owen Lake	30
Fayetteville, Davidson's pond	40
White River, Middle Fork	100
Genoa, Hall's pond	140
Little Rock, Spring Lake	140
Morrillton, Earl's pond	35
Patmos, Lafferty's lake	140
Russellville, Galla Creek	105
Colorado: Wray, Robb Lake	300
Connecticut:	
Waterbury, Hill Pond	70
Smith Pond	35
District of Columbia: Washington, Rhodmont Lake	40
Florida:	
Orlando, Lake Florence	84
Lake Lucy	84
Lake Stanley	84
Georgia:	
Cusseta, Shipp Place Pond	90
Greensboro, Richland Creek	25
Mora, Walker's pond	50
Stone Mountain, Venable Lake	100
Swainsboro, Rountree Pond	100
Tifton, Waterloo Pond	90
Illinois:	
Ava, Ava Springs Lake	80
Belleville, Fern Glen Lake	120
Carbondale, Lake Goodman	360

[a] The fish here listed were rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1917—Continued.

CRAPPIE AND STRAWBERRY BASS—Continued.

Disposition.	Number.
Illinois—Continued.	
Crystal Lake, Crystal Lake	1,200
Dallas City, Lake Cooper	1,104
East St. Louis, Cemetery Pond	120
Elizabeth, Apple River	300
Farmer City, Salt Creek	35
Galena, Mississippi River	a 93,000
Galesburg, City Lake	35
McComb, Ruebushe's pond	80
Millington, Fox River	35
Moline, Power Pond	120
Pana, Converse's pond	120
Panama, Faudi's pond	80
Philadelphia, Willow Pond	40
Prairie du Rocher, Dinan's pond	80
Red Bud, Benzie Pond	80
Red Bud Lake	200
Shelbyville, Kaskaskia River	80
Indiana:	
Corydon Junction, Diedrick's pond	100
Edinburg, Sugar Creek	175
English, Little Blue River	400
Indianapolis, Fan Lake	35
White River	140
La Grange, Blackman Lake	35
Cedar Lake	200
Fish Lake	200
North Twin Lake	35
Oliver Lake	70
Still Lake	200
Muncie, Gravel Pit Pond	35
Lagoon Pond	35
New Albany, Perrettes Lake	150
Peru, Eel River	70
Plymouth, Twin Lakes	70
Portland, Bailey's pond	35
Ramsey, Bush's pond	100
Rome City, Sylvan Lake	70
Terre Haute, Gravel Pit Pond	160
Waynetown, Harvey's pond	35
Iowa:	
Bellevue, Mississippi River	a 180,875
Boone, Des Moines River	90
Corning, Nestling Water Pond	30
Vernon's pond	60
Eldora, Iowa River	180
Fairport, Mississippi River	a 43,335
Guthrie Center, Woodland Lake	35
Manchester, Maquoketa River	3,000
North McGregor, Mississippi River	a 261,000
Kansas:	
Baileyville, Anthony Far Pond	140
Chanute, Allen Lake	1,000
Edwardsville, Betts Creek	35
Forest Club Lake	70
Marshall Creek	35
Mission Creek	35
Elk Falls, Elk River	105
Kincaid, Grindstone Lake	35
Pittsburg, Radels Pond	100
Shout's pond	100
Stanley, Rural Retreat Lake	70
Kentucky:	
Anchorage, Spring Hill Lake	200
Brodhead, Dix River	80
Negro Creek	80
Crab Orchard, Crab Orchard Lake	80
Danville, Sallee's pond	40
Gatliff, Big Poplar Creek	40
Georgetown, Hall's pond	40
North Elkhorn Creek	120
Greensburg, Green River	160
Guthrie, Durham's pond	70
Hodgenville, Walters's pond	80
Kuttawa, Cumberland River	a 4,921
Lakeland, Hospital Lake	200
Lawrenceburg, Marrs Lake	80
Kentucky—Continued.	
Lexington, Le Bus's pond	40
Sink Hole Pond	40
Wallace Pond	80
Logana, Adams's pond	40
Louisville, Floyd Fork	1,400
Harrods Creek	1,400
Landsdowne Lake	50
Sears Pond	175
Maceo, Kingfisher Lake	1,000
Owensboro, Lewis's pond	100
Lyne's pond	100
Shelbyville, Brown's pond	200
Clear Creek	600
Springfield, Neikirk's pond	40
Whitesburg, Rosedale Pond	40
Williamsburg, Cumberland River	120
Winchester, True's pond	40
Witherspoon's pond	40
Louisiana:	
Florien, Mill Creek	80
Homer, McKenzie's pond	70
Myrtis, Mill Pond	80
Maryland:	
Frederick, Monocacy River	40
Seneca, Potomac River	a 350
Massachusetts: Plymouth, South Triangle Pond	105
Michigan:	
Fabius, Clear Lake	105
Floodwood, Lily Lake	120
Highland, Lakes in Oakland County	770
Houghton, Fales Lake	160
Huron Pond	160
Indian River, Indian River	35
Jackson, Big Portage Lake	70
Marquette, Deer Lake	120
Nashville, Willow Pond	35
Reed City, Lake Osceola	105
Minnesota:	
Buffalo, Buffalo Lake	120
Central Lakes, Augusta Lake	120
Degraff, St. Marys Lake	175
Forado, Union Lake	60
Homer, Mississippi River	a 209,350
Lake City, Lake Pepin	a 13,325
Little Falls, Fish Lake	100
Minneapolis, Cedar Lake	120
Morristown, Pleasant View Pond	60
North Branch, Rice Lake	150
Owatonna, Lonergan Lake	60
Preston, Root River, Middle Branch	60
Root River, South Branch	60
Richmond, Mississippi River	a 39,200
Rochester, Mill Pond	60
Tamarack, Kelley Lake	100
Winona, Lake Winona	120
Mississippi River	a 39,350
Mississippi:	
Aberdeen, Baker Lake	140
Cantrell Lake	105
Ackerman, Hemphill's pond	35
McKnight's pond	70
Columbus, Owen Pond	35
Corinth, Young's pond	70
Crystal Springs, Batton's pond	105
Flora, Lipscomb's pond	70
Friar Point, Mississippi River	a 2,785
Hazlehurst, Crystal Lake	80
Fletcher's lake	105
Lake Hazel	140
Marchetti's lake	65
Jackson, Spring Lake	175
Willow Pond	70
Kosciusko, Bailey Lake	175
Meridian, Reed Brake Pond	35

a Rescued from overflowed lands and returned to original waters.

Distribution of fish and eggs, fiscal year 1917—Continued.

CRAPPIE AND STRAWBERRY BASS—Continued.

Disposition.	Number.	Disposition.	Number.
Mississippi—Continued.		Oklahoma—Continued.	
Pontotoc, Pontotoc Pond	125	Choteau, Adkins Lake	40
Quincy, Bird's pond	35	Nunley's pond	80
Senatobia, Mitchell's pond	70	Cushing, Fleming's pond	159
Water Valley, Otuckolofa Club Lake	105	Elgin, Sawin's pond	35
Missouri:		El Reno, Petrees Pond	35
Aurora, Honey Creek	300	Erick, Henke's pond	35
Baring, Baring Lake	200	Fallis, Lake Charles	53
Blackburn, Blackburn Pond	300	Frederick, Godard Lake	35
Bonnots Mill, Smith Lake	200	Prairie Spring Lake	35
Cabool, Graves's pond	100	Slack Lake	35
Cadet, Fountain Farm Pond	200	Goteba, Hinton Lake	35
Calhoun, Butler Lake	100	Minton Lake	35
Ferguson, Wabash Club Lake	608	Gould, Duncan's pond	35
Fortesque, Bigelow Lake	2,120	Grandfield, Cassidy's lake	35
Grandview, Berry Pond	100	Cottonwood Lake	35
Rollo Pond	100	Lake Willow	35
Kansas City, Weber's pond	100	Granite, Irion's pond	35
Lathrop, High Point Lake	300	Olds's pond	35
Lake Benson	400	Guthrie, Beets Lake	53
Lebanon, Mayfield's pond	150	Indian Lake	53
Lisle, Lisle Lake	600	Santa Fe Lake	53
Peirce City, Clear Creek	200	Seeley's lake	53
Pleasant Hill, Bond Lake	200	Williams Lake	53
Potosi, Mineral Fork Creek	200	Haworth, Hughes's pond	40
Rolla, Congressional Club Ponds	200	Hickory, Canyon Lake	53
Cowan's pond	100	Hobart, Bottom's pond	35
Lily Pond	200	Little Otter Creek	35
Ozark Lake	200	Terry Lake	70
New Mexico:		Hollis, Nell's pond	35
Artesia, Jerome's pond	40	Keystone, Dry Lake	53
Clayton, North Canyon Creek	80	Kiowa, Kiowa Katy Lake	120
Haswell, Blue Lake	240	Konawa, Autry's pond	53
Roswell, Haymaker's pond	40	Bates's pond (A)	53
Lea Lake	40	Bates's pond (B)	53
North Carolina:		Jumper Pond	53
Franklinton, Good Luck Pond	35	Maxwell's pond	53
Hendersonville, Maybank's lake	80	Lone Wolf, Carson's pond	35
Kinston, Carraway's pond	200	Poling's pond	35
Kittrell, Moore's pond	35	Loveland, Dunbar Lake	35
Littleton, Johnston's pond	140	Mangum, Houpe's pond	35
Warren Pond	175	Lake Orth	105
Louisburg, Jackson Pond	35	Rocher's pond	35
Roseboro, Great Swamp Pond	40	Maramec, Maramec Lake	53
Winston-Salem, Lake Katherine	120	Pattison's pond	53
North Dakota:		Marlow, Roach Lake	35
Bottineau, Lake McArthur	300	Marshall, Otter Creek	35
Long Lake	300	Mountain View, Kendrick Pond	35
Loon Lake	300	Nast, Reid's pond	35
Devils Lake, Devils Lake	1,000	Newkirk, Club Pond	53
Ohio:		Railroad Lake	53
Cambridge, City Lake	120	Oklahoma City, Armor's pond	53
Tin Mill Pond	40	Sandringham Lake	53
Chillicothe, Paint Creek	160	Steanson's pond	53
Cincinnati, Chapman's pond	35	Oakwood, Mound Lake	35
Stone Lick Creek	105	Owasso, Silver Lake	53
Crestline, Sandusky River	105	Pawhuska, Bird Creek	53
Midland City, Lake Stanislaus	35	Bird Creek, North Fork	53
Morrow, Little Miami River	105	Perkins, Perkins Pond	53
Little Miami River, Todds Fork	105	Perry, Pagel's pond	53
St. Marys, Lake St. Marys	500	Sapulpa, Anderson's pond	53
Williamsburg, Little Miami River, East Fork	70	City Lake	53
Winchester, WhiteOak Creek	70	Euchre Lake	53
Oklahoma:		Meyer's pond	53
Ada, Shady Lake	40	Moses's pond	53
Agra, Robertson's pond	53	Rock Creek Pond	53
Altus, City Lake	70	Seminole, Grove Lake	53
Ardmore, Chickasaw Lake	120	Roscoe's pond	53
Club Lakes	160	Templeton's pond	106
Asher, White Lake	50	Shattuck, Ivanhoe Lake	105
Aydelot, Willow Lake	53	Shawnee, Blue Valley Pond	53
Bessie, Besler's pond	35	Karr Lake	53
Boley, Elm Lake	53	Maud Lake	53
Bristow, Jones's pond	53	Stillwater, Chandler's pond	53
Byars, Byars Lake	70	City Pond	53
Lake Haiwawa	70	Deck's pond	53
Lake Peavine	70	Haskett Pond	53
Richards's pond	70	Kelly's pond	53
Cement, Cooper's pond	35	Lowry's pond	53
		Westbrook's pond	53

Distribution of fish and eggs, fiscal year 1917—Continued.

CRAPPIE AND STRAWBERRY BASS—Continued.

Disposition.	Number.	Disposition.	Number.
Oklahoma—Continued.		Texas—Continued.	
Stillwater, Willow Lake	53	Detroit, Brickyard Pond	100
Yost Lake	53	Grasslands Pond	100
Stroud, Silver Pond	53	Edgewood, King's lake	35
Tecumseh, Drake Lake	53	El Paso, Cement Lake	70
Nichols Lake	53	Fort Worth, Fossil Lake	105
Parker Lake	53	Fruitvale, Hazel's pond	35
Santa Fe Lake	53	Gatesville, Leon River	210
Walter, Parish's pond	35	Plum Creek	70
Wanette, West's pond	53	Georgetown, San Gabriel River	300
Wilburton, Newsom's pond	40	Gilmer, Buie Lake	35
Pennsylvania:		Flag Lake	70
Altoona, Juniata River	120	Smith Lake	35
Ephrata, Cocalico Creek	80	Graford, Doan's pond	150
Lancaster, Conestoga Valley Pond	120	Rider Lake	150
Waterworks Pond	120	Grand Saline, Bermuda Grove Pond	35
La Plume, Keewanee Pond	80	Lake Wood	35
Manataka Pond	80	Grandview, Country Club Lake	300
Rushland, Neshaminy Creek	120	Grapeland, Clear Lake	35
Waterford, Lake LeBoeuf	80	Herods Lake	35
South Dakota:		Howard's pond	35
Lake Andes, Lake Andes	210	Spring Lake	35
Madison, Lake Madison	245	Round Lake	35
Pukwana, Red Lake	245	Greenville, City Pond	300
Scotland, James River	140	Hulsey's pond	100
Sioux Falls, Brant Lake	140	Hawkins, Little Sandy Club Lake	70
Tennessee:		Ireland, Laxson's pond	35
Collierville, Daffodil Pond	35	Jacksonville, Allis Lake	70
Estill Springs, Elk River	105	Alexander's lake	70
Elk River Mill Pond	70	Boles Lake	300
Hickory Valley, Terpedega Pond	70	Canon's lake	70
McMinnville, Barren Fork Creek	80	Sory's lake	70
Collins River	80	Jermyn, Roberts's pond	100
Memphis, Peter Pond	70	Jewett, Lake Estelle	35
Sink's pond	70	Kerrville, Guadalupe River	300
Milan, Black Jack Pond	70	Wahrmund's pond	30
Oliver Springs, Valley View Pond	80	Laredo, Wormses Pond	150
Shelbyville, Duck River	105	Longview Junction, T. & P. Lake	100
Tune's pond	70	Marshall, Annie Lake	150
Springfield, Babb's pond	70	Fern Leaf Lake	150
Red River, Sulphur Fork	70	Melvin, Valley Lake	35
Tellico Plains, Lake Tellico	80	Menard, Las Moras Creek	35
Texas:		San Saba River	105
Alvarado, Lake View	70	South Elm Creek	70
Annona, Snow Lake	83	Wallick Lake	35
Atlanta, Brush Pond	150	Water Hole Lake	35
Johnson's pond	100	Mesquite, Dallas Mesquite Lake	70
Bagwell, Gin Lake	100	Lake Hazel	70
Baird, Hancock's pond	70	Mineral Wells, Lake Pinto	150
Turner's pond	35	McCracken's pond (A)	100
Big Springs, Lucian Wells Lake	35	McCracken's pond (B)	100
Blossom, Brickyard Pond	150	Slaughter Creek	150
Bogata, Griffin Lake	150	Watson's pond	100
Bonham, Johns Estill Repose Lake	75	New Boston, McGee Lake	83
Steger's pond	75	Omaha, Hayes's pond	35
Burton, Jaroszwesky's pond	100	Palestine, Bowen Lake	100
Watson's pond	100	Braughton Lake	75
Caldwell, Elizabeth Lake	35	Brush Lake	150
Gum Lake	35	East Side Park Lake	150
Hitchcock's pond	35	Elkhart Lake	105
Center Point, Guadalupe River	300	Guinn's pond	150
Clarksville, Allen's pond	60	Huff Lake	100
Country Club Lake	299	Leach Lake	150
Dimple Lake	35	Sand Lake	150
Red River Lake	249	Satine Lake	150
Comfort, Holiday Creek	150	South Side Lake	75
Corsicana, Derden's pond	35	Spring Lake	150
Frost Pond	35	Spring Park Lake	150
Magnolia Pond	35	Thomas Lake	150
Crockett, Beeson Pond	35	Willow Lake	300
Burton Lake	35	Paris, Crowley Pond	75
Frannon Lake	35	Holt's pond	100
Grannis Creek	35	Pearsall, Geyer's pond	50
Lake Mask	35	Petty, Beville's pond	75
Saterwhite's pond	70	Rutherford's pond	100
Smith Lake	70	Pilot Point, Peel's pond	100
Dallas, Highland Lake	100	Rock Crusher, Rock Crusher Lake	150
Del Rio, Devils River	140	Round Rock, Brushy Creek	105
Deport, Old West Brook Pond	100	Rugby, Griffin Lake	150
		Sabinal, Onion Creek	70

Distribution of fish and eggs, fiscal year 1917—Continued.

CRAPPIE AND STRAWBERRY BASS—Continued.

Disposition.	Number.
Texas—Continued.	
San Marcos, Cape's pond	200
Redwood Pond	48
San Marcos River	4,000
San Saba, Barnett Creek	35
Sherman, Vaden Lake	100
Strawn, Palo Pinto Creek	70
Terrell, Bond's pond	35
Fletcher's pond	70
Midland Lake	35
Texarkana, Davis Lake	150
Spring Lake	150
Tulia, Round Lake	150
Sunnyside Lake	150
Tyler, Chinquapin Lake	70
Hitts Mill Pond	70
Rowland's pond	35
Uvalde, Leona River	70
Nueces River	70
Waco, Katy Lake	200
Weatherford, Holland's lake	100
Welfare, Joshua Creek	150
Willis, Howell's pond	35
Wills Point, Beauty Pond	100
Dodson Lake	100
Farm Lake	100
Hamilton Lake	150
Lake Allen	35
Lake Goodnight	100
Lake Howell	150
Lake Osborne	150
Lake Perry	100
Lake Theodore	150
Lake William	150
Moss Lake	100
Williams Lake	100
Willow Pond	100
Woodland Lake	100
Winona, Butterfield's pond	35
Virginia:	
Burhans Wharf, Haley Mill Pond	200
Clarksville, Green Pond	80
Cullen, Robertson's pond	80
Ford, Coleman's mill pond	80
Franklin City, Powell's mill pond	120
Front Royal, Barnett's pond	280
Glen Allen, Chickahominy Pond	40
Harrisonburg, Eversole Pond	40
Meadow, Rosecrest Farm Pond	40
Richmond, City Lakes	80
Fulton Club Lake	80
Waterview Pond	200
Yaley Mill Pond	80
Suffolk, Lake Darden	120
Lake Savage	80
Neblett's pond	80
The Plains, Goose Creek	360
West Virginia: Lochgelly, Williams's pond	150
Wisconsin:	
Amery, Clare Lake	200
Wapogasset Lake	200
Bennett, Lake Munising	600
Wisconsin—Continued.	
Blair, Trempealeau Pond	300
Brokaw, Battle Creek	400
Brokaw Pond	200
Trapp River	400
Cable, East Lake	300
Centuria, Poplar Lake	120
Donaldson, Porcupine Lake	50
Fountain City, Mississippi River	[a] 194,660
Genoa, Mississippi River	[a] 50,000
Gordon, Bardon Lake	600
La Crosse, Mississippi River	[a] 160,000
Ladysmith, Bass Lake	200
Bucks Lake	200
Lake Polaski	200
Lake Stephenson	200
Lynxville, Mississippi River	[a] 5,000
Menomonie, Cedar Lake	100
Hay River	100
Lake Menomonie	100
Manleys Bend Lake	100
Moore Farm Lake	100
Pitt Lake	100
Red Cedar River	100
Rowe Lake	100
Stump Lake	100
Nebagamon, Lake Nebagamon	600
Norrie, Bass Lake	200
Norrie Lake	200
Pike Lake	200
Pine River, Pine River	400
Rice Lake, Deer Lake	200
Desair Lake	200
Island Lake	200
Raspberry Lake	200
Rice Lake	200
Silver Lake	200
Spruce Lake	200
Tuscobia Lake	200
Schultz, Ackerman Lake	400
Solon Springs, Lake St. Croix	600
Paradise Lake	600
Sparta, Mission Bend Lake	300
Three Lakes, Little Moccasin Lake	50
Tomahawk, Bass Lake	600
Trempealeau, Mississippi River	[a] 182,515
Turtle Lake, Horseshoe Lake	200
Lower Turtle Lake	200
Silver Lake	100
Upper Turtle Lake	100
Wascott, Red Lake	600
Wausau, Borax Creek	200
Eau Claire River	400
Gunmore Creek	200
Lake Wausau	300
Rib Lake	200
Rib River	200
Road Lake	200
Short Portage Lake	200
Wonewoc, Tank Pond	390
Total [b]	1,565,072

LARGEMOUTH BLACK BASS.

Alabama:	
Abbeville, McCalls Mill Pond	1,500
Aliceville, Cunningham Lake	1,000
Gardner Lake	1,500
Ashby, Six Mile Creek	24
Ashland, Axton Lake	1,000
Birmingham, City Lake	40
Brent, Tucker Pond	150
Alabama—Continued.	
Brewton, Brickyard Pond	†3,000
Burnt Corn Creek	†5,000
Canoe, Gordon Spring Pond	†4,000
Carrollton, Central Springs Pond	60
Sapps Valley Lake	1,500
Castleberry, Bell Pond	†2,000
Thames Pond	†2,000

[a] Rescued from overflowed lands and returned to original waters.
[b] Lost in transit, 1,156.

Distribution of fish and eggs, fiscal year 1917—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.
Alabama—Continued.	
Centerville, Avery Lake	600
Cooper Lake	600
Lightsey Lake	600
Coopers, Horse Creek	†2,000
Courtland, Big Nance Creek	†5,000
Mountain Lake	†1,000
Decatur, Beaver Lake	†4,000
Swan Lake	†4,000
Eoline, Hobson's pond	600
Eutaw, Choctaw Pond	1,000
Evergreen, Cane Brake Creek	†4,000
Florala, Lake Jackson	1,500
Lake Williams	1,500
Florence, Cypress Creek	†1,000
Fort Mitchell, Cantey's pond	64
Fort Payne, Little River	†2,000
	500
Gastonburg, Vincent Pond	450
Geneva, Choctawhatchee River	1,500
Goodwater, Goodwater Pond	1,500
Gordon, Bazemore Mill Pond	1,500
Gurley, Hurricane Creek	500
Headland, Shady Lake	3,000
Three Cornered Pond	2,000
Hillsboro, Quarry Pond	†2,000
Huntsville, Indian Creek	2,000
Jacksonville, Browns Pond	2,500
Jones, Kelly Pond	12
Lawley, Okmulgee Pond	600
Letohatchie, Bullock Pond	1,000
Guy's pond	1,000
Sanderson's pond	2,000
Lineville, Lake Mae	70
Worthy's pond	†1,000
Lockhart, Still Pond	500
Luverne, Campbell's pond	250
Kendrick-Ruff Lake	250
McGehees, Shackleford's pond	1,000
Madison, James Pond	35
Milstead, Mitchel Creek Pond	†2,000
Mobile, Deer River	†2,000
Montgomery, Crescent Lake	1,500
Hill Pond	1,000
Montgomery Lake	5,000
Shooting Club Lake	105
Whetslenes Lake	1,500
Mountain Creek, Arnold's pond	†2,000
Oneonta, Armstrong Creek	24
Black Warrior River	24
Opelika, Wetumpka Creek	†2,000
Ozark, Weeks's pond	250
Patsburg, McNeill's pond	250
Pine Hill, Indian Creek	400
Ramer, Collier's pond	†3,000
Harwell Pond	†1,000
Holmes's pond	†1,000
Waller's pond	†4,000
Riderwood, Lake Choclahona	200
Roanoke, Seroyer's pond	†3,000
Usery's pond	35
Scottsboro, Gossett Creek	35
Selma, Harper-Melton Lake	300
Silver Well Lake	12
Speigner, Speigner Lake	†6,000
Sprague, Duncan's pond	250
Suggsville, Cedar Lake	750
Sulligent, Bogue Creek Pond	70
Sulphur Springs, Lookout Creek	175
Talladega, Mountain Creek	†3,000
Troy, Bashinsky's pond	500
Cochran Mill Pond	1,550
Tyson, Farrior's pond	2,000
Fleming Lake	1,000
Jones Lake	2,500
Tyson Lake	2,000
Williams Lake	1,500
Union Springs, Mill Pond	64
Rosenstihl's pond	64
Alabama—Continued.	
Uniontown, Cherokee Pond	640
Vinegar Bend, Mill Pond	†3,000
Wellington, Cowden's pond	†1,000
	1,000
York, Mellown's pond	†1,000
	1,000
Arizona:	
Flagstaff, Mormon Lake	120
Geronimo, Wightman Ranch Lake	75
Gleed, Horseshoe Pond	40
Globe, Roosevelt Lake	700
Holbrook, Thomas's pond	25
Morenci, Eagle River	175
Winslow, Clear Creek	160
Arkansas:	
Arlberg, Little Red River	300
Atkins, Whiteside Pond	72
Bellefonte, Crooked Creek	400
Huzzah Creek	300
Benton, Saline River	50
Black Rock, Black River	803
Conway, Owen Lake	500
Daggett, Cache River	100
Dardanelle, Oakdale Lake	120
Earle, Lake Beautiful	315
Outzen's Lake	210
Edgemont, Little Red River	300
Elba, Little Red River	300
Elkins, Mountain Lake	35
Fairmon, Fish Creek	60
Fayetteville, Richland Creek	36
White River	48
White River, Middle Fork	90
White River, West Fork	36
Gilbert, Buffalo River	300
Harrison, Crooked Creek	200
Hartford, Boteau River, Jim Fork	40
Heber Springs, Little Red River	460
Helena, Lake Solomon	40
Higden, Little Red River	200
Hiwassee, Brinegar's pond	30
Hughes, Belle Meade Lake	120
Leslie, Little Red River	300
Little Rock, Spring Lake	72
Luna Landing, Lake Chicot	105
Malvern, Baugh's pond	70
Miller, Little Red River	300
Oakvale, Little Red River	300
Ozark, Turner's pond	120
Patmos, Lafferty Lake	90
Pine Bluff, Atkins Lake	120
Poe, Little Red River	600
Rogers, Osage Creek	120
Rottaken, Big Lake	150
Clear Creek	100
Fourche Bayou	150
Grassy Lake	24
Horseshoe Lake	24
Kykendall Lake	100
Lorance Creek	150
Maple Creek	24
Pennington Bayou	24
Wolf Bayou	24
Rumley, Little Red River	300
Sandiff, Little Red River	300
Scotts, Chenault Lake	150
Fletcher Lake	200
Hill Lake	100
Horseshoe Lake	36
Old River	150
Pemberton Lake	100
Plum Bayou	36
Scotts Bayou	100
Steele's lake	100
Shirley, Little Red River	300
Springdale, Brush Creek	90
Walker Lake	90
Walnut Spring Lake	60

Distribution of fish and eggs, fiscal year 1917—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.
Arkansas—Continued.	
Stamps, Stamps Lake	48
Texarkana, Hubert Lake	20
Pine Dell Lake	30
Thornton, Pine Lake	50
Toltec, Mound Lake	60
Waldo, Clear Lake	60
Grassy Lake	60
Colorado:	
Brandon, Chivington Lake	300
Calhan, South Butte Reservoir	95
Spring Pond	95
Denver, Lakewood Lakes	95
Durango, Animas River	246
Fort Logan, Rucker Lake	380
Haswell, Blue Lakes	500
Holly, Bear Creek Pond	95
East Slope Pond	95
Johnston's pond	95
Lamar, Two Buttes Lake	1,425
Las Animas, Blue Lake	475
Loveland, Southside Lake	40
Nepesta, Dotson Lake	285
Nyburg, Setters Lake	285
Palmer Lake, Palmer Lake	100
Pueblo, Goodnight Pond	190
Hayden Lake	285
Rocky Ford, Sugar Club Lake	475
Salida, Davy Lake	190
Sterling, Point of Rocks Lake	380
Connecticut:	
Canaan, Long Pond	80
Twin Lakes	240
East Lyme, Cedar Lake	120
Patagausett Lake	120
Hartford, Mountain Creek	150
Norwalk, Crystal Lake	100
Tariffville, Nash Pond	150
Wallingford, Quanipaug Lake	225
Waterbury, Pearl Lake	400
West Willington, Hockey Lake	200
Delaware:	
Delaware City, Scotch Run Lake	200
Laurel, Records Lake	300
Florida:	
Bartow, Lake Ann	1,000
Lake Beula	1,000
Lake Garfield	1,500
Bascom, Piney Pond	1,500
Davenport, Lake Buckeye	1,515
De Funiak Springs, Blue Pond	1,000
Florence Villa, Lake Conine	1,200
Lake Eloise	1,200
Lake Fanny	1,200
Lake Hailton	1,200
Lake Lucerne	1,000
Lake Smart	1,200
Lake Spring	1,200
Geneva, Buck Lake	2,000
Mohawk, Juanata Lake	2,000
Orlando, Big Sand Lake	2,500
Perry, Whiddon's pond	30
Pine Castle, Lake Conway	3,000
Sebring, Lake Menon	1,070
Lake Thelma	1,024
Summerfield, Little Lake Weir	2,000
Tallahassee, Buck Lake	1,750
Lake Hall	1,750
Tampa, Strawberry Lake	1,500
Tavares, Lake Dora	500
Windermere, Lake Butler	1,500
Lake Downes	1,500
Georgia:	
Alston, Southside Pond	1,000
Arlington, Plantation Pond	3,000
Ashburn, Kerce Mill Pond	1,000
Rock House Pond	1,000
Shingler's pond	800
Whiddon Lake	3,000
Athens, Brooks's pond	1,000
Georgia—Continued.	
Atlanta, Clara Meer Lake	475
East Lake	†4,000
Lake Wyanoke	3,000
Piedmont Park Lake	4,000
Augusta, Carmichael Pond	450
Austell, Sweetwater Creek	4,000
Beach, Moore's pond	150
Bellville, Briarwood Pond	500
Bishop, Appalachee River	5,000
Park Lake	1,500
Blythe, Palmer Pond	100
Boneville, Johnson's pond	150
Boston, Lako Pond	1,500
Bowdon, Maple Pond	100
Box Springs, Lake Mohignac	4,000
Bremen, Nelson's pond	2,000
Byron, Lower Pond	4,000
Cartersville, Callaway's mill pond	2,000
Jackson Creek	3,000
Jackson Mill Pond	2,000
Raccoon Creek	2,000
Reeves Lake	1,500
Stamp Creek	3,000
Cecil, Kings Pond	1,000
Chula, Pate Mill Pond	1,500
Cuthbert, Butler Pond	2,000
Coleman Pond	2,000
Cox's pond	3,000
Davis's pond	3,000
Hill's pond	2,000
Hoods Pond	2,000
Wade's pond	2,000
Dacula, Alcova River Pond	210
Dalton, Swamp Creek	†3,000
Eton, Holly Creek	3,000
Mill Creek	3,000
Gibson, Smith Branch	500
Greensboro, Bowden Pond	900
Griffin, Clearwater Pond	350
Hahira, Gaskins's pond	1,200
Haralson, Swygert's pond	700
Hogansville, Flat Creek	3,000
Jonesboro, Chambers Pond	3,000
Jesters Old Mill Lake	4,000
Kibbee, Adams's pond	75
Lake Park, Lake Francis	1,500
Ocean Pond	1,500
Zaret Pond	1,500
Lumpkin, Bladen Creek Pond	2,000
Perkins's pond	3,000
Womberly Mill Pond	2,000
McIntyre, Edgars Pond	2,000
Manchester, Manchester Mill Pond	3,000
Meigs, Parmer's pond	1,000
Moultrie, Ladson's pond	2,000
Ocilla, Paulk's pond	1,000
Omaha, Brown Pond	2,000
Palmetto, Johnson's pond	2,000
Pavo, Adams Pond	2,500
Quitman, Blue Pond	1,000
Raymond, Raymond Lake	6,000
Reidsville, Beasley's pond	500
Rockingham, Johnson Mill Pond	1,000
Rome, Rotary Lake	1,000
Roseland Station, Brickyard Lake	4,000
Sandersville, Johnson's pond	100
Screven, Brady's pond	1,500
Shellman, Crittenden's pond	1,500
Hart's pond	1,500
Siloam, Boswell's pond	300
Social Circle, Stanton's pond	1,500
Sparta, Archer's pond	150
Sycamore, Donohoo Gin Pond	500
Trion, Riegel's pond	†3,000
Round Pond	†1,000
Valdosta, Bentley Pond	1,000
Jo Rie Pond	1,500
Varn's pond	2,000
Vidalia, Swift Creek	2,000

Distribution of fish and eggs, fiscal year 1917—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.
Georgia—Continued.	
Vienna, Gregory's pond	150
Warm Springs, Thomas's pond	85
White Plains, Humphrey's pond	100
Jernigan's pond	600
Willacoochee, Clara Pond	75
Fetcher's pond	1,500
Moore's pond	1,500
Paulk's pond	1,500
Woodbury, Betts Pond	†2,000
Wrens, Armstrong's pond	1,500
Wrightsville, Ohoopee Creek	300
Illinois:	
Alpha, Crescent Lake	700
Anna, Sitter's lake	200
Apple River, Apple River	390
Barstow, Rock River	400
Belleville, Club Pond	300
Brighton, Stubblefield Lake	120
Brownfield, Rainbow Lake	300
Carterville, Crain Lake	600
Centralia, Lake Centralia	750
Chicago, Aquarium	25
Christopher, Harrison's pond	150
Klein's pond	200
Council Hill, Fever River	224
Crystal Lake, Crystal Lake	1,000
Dallas City, Lake Cooper	a 192
Edwardsville, St. Claire Pond	1,000
Effingham, Ewington Pond	200
Elizabeth, Apple River	2,772
Farmer City, Salt Creek	40
Farmington, Howell's pond	90
Franklin, Burlington Lake	120
Galena, Mississippi River	a 8,000
Galesburg, City Lake	40
Gilchrist, Continental Lake	300
Hillsboro, Hill-Morrow Pond	60
Irving, Wilson's pond	120
Iuka, Oakwood Lake	300
Lebanon, Siegel's pond	300
Marshall, Spring Lake	60
Meredosia, Meredosia Bay	a 95
Millington, Fox River	80
Moline, Power Pond	720
Monmouth, Country Club Lake	90
Illinois Central Pond	90
Murphysboro, Stecher's lake	80
Nora, Apple River	624
North Hanover, Apple River	308
O'Fallon, Birch Spring Pond	100
Red Bud, Red Bud Lake	300
Sylvan Lake	300
Rodden, Apple River	154
Roodhouse, City Reservoir	300
Salem, City Lake	400
Scales Mound, Fever River	312
Shawneetown, Gregory Memorial Pond	150
Okerson's mill pond	150
Shelbyville, Kaskaskia River	40
Stockton, Plum River	266
Trenton, Carr's pond	150
Hanke's lake	300
Troy, Reider's pond	200
Warren, Apple River	1,950
Indiana:	
Alexandria, Englewood Pond	75
Angola, Loon Lake	150
Batesville, Waterworks Pond	120
Bremen, Lake of the Woods	150
Bruceville, Brantlinger's pond	80
Centerpoint, Steuerwald's pond	100
Churubusco, Gandy Pond	100
Corydon, Buck Creek	800
Engleman's pond	100
Silver Lake	400
Crandall, Indian Creek	300
Indiana—Continued.	
Crete, Jessup Mill Pond	200
Culver, Lake Maxinkuckee	325
Dugger, Sunflower Lake	120
Edinburg, Sugar Creek	200
English, Little Blue River	300
Evansville, Evensmere Pond	700
Infirmary Lake	100
Greenfield, Sugar Creek	120
Huntingburg, Ferdinand Lake	200
Indianapolis, Ben Hur Pond	80
Fall Creek	120
Kendallville, Tamarack Lake	150
La Grange, Long Lake	150
Royer Lake	150
South Twin Lake	150
Largo, Wabash River	200
Leesburg, Tippecanoe Lake	300
Lena, Alma Pond	80
Liberty, Lily Pond	40
Logansport, Kline's pond	75
Lake Chicott	150
Michigan City, Vail Mill Pond	80
Milton, Butler Creek	80
Martindale Creek	120
Simons Creek	120
Whitewater River, Greens Fork	120
Whitewater River, Nolans Fork	120
Whitewater River, West Fork	120
Monticello, Honey Creek	150
Pike Creek	150
Muncie, Gravel Pit Pond	75
New Albany, Indian Creek	300
New Carlisle, Hudson Lake	150
Ockley, Gravel Pit Pond	75
Otisco, Fourteen Mile Creek	300
Pendleton, Fall Creek	300
Pierceton, Webster Lake	150
Plymouth, Pretty Lake	150
Ray, Clear Lake	225
Long Lake	150
Round Lake	150
Rockport, Hooppole Creek	200
Sellersburg, Belknap Lake	1,200
Globe Lake	400
Seymour, White River, East Fork	80
Terre Haute, Kolsem's pond	40
Tipton, Shadyside Pond	40
Valparaiso, Flint Lake	150
Long Lake	150
Veedersburg, Patton Lake	120
Walcottville, Dallas Lake	150
Walkerton, Koontz Lake	150
Walton, Kesling's pond	75
Washington, Zinkan's pond	40
Iowa:	
Anamosa, Buffalo River	300
Bellevue, Mississippi River	a 24,410
Boone, Des Moines River	240
Central City, Buffalo River	400
Clear Lake, Clear Lake	120
Creston, Summit Lake	200
Des Moines, Buxton Pond	60
Eldora, Iowa River	240
Fairfield, Adams's pond	80
Fairfield Pond	8,300
Fryman's pond	80
Fairport, Mississippi River	a 6,349
Knoxville, City Pond	60
Lime Springs, Upper Iowa River	5,000
Manchester, Maquoketa River	1,000
Maynard, Volga River, South Branch	60
Monticello, Maquoketa River	300
Nashua, Big Cedar River	120
Nevada, Dayton Park Lake	80
North McGregor, Mississippi River	a 6,800
Onawa, Blue Lake	160
Osceola, Rarike's pond	80

a Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1917—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.	Disposition.	Number.
Iowa—Continued.		Kentucky—Continued.	
Steamboat Rock, Iowa River	240	Pembroke, Pendleton Lake	200
Story City, Lake Co-Mar	60	Providence, Luton Lake	200
Washington, Highland Park Lake	195	Shamrock Lake	200
West Burlington, Railroad Pond	325	Russellville, Davidson Pond	200
Kansas:		Edwards Pond	200
Chanute, Allen Lake	550	Flowers Pond	100
Edwardsville, Cement Lake	300	Parker Pond	100
Lake of the Forest	500	Perry's pond	100
Elk Falls, Elk River	130	Pulliam Pond	100
Fort Scott, Bridal Veil Lake	800	Simmons Pond	100
Sheeler Lake	1,000	Talley Pond	200
Girard, Allison's pond	200	Ryland, Club Pond	40
Havana, Santa Fe Lake	600	Stithton, White Lily Lake	800
Huron, Anthony Farm Pond	260	Vanarsdell, Bond's pond	40
Pittsburg, Embree Pond	450	Vanceburg, Kinniconic Creek	300
Richmond, Santa Fe Lake	130	Whitesburg, Kentucky River	40
Soldiers Home, Lake Jeannette	65	Kentucky River, North Fork	40
Topeka, Berry Creek	300	Louisiana:	
Cedarcrest Lake	200	Bayou Sara, Magnolia Pond	†1,000
Deer Creek	305		1,000
Mission Creek	300	Ethel, Greenbrier Lake	100
Kentucky:		Lake Lillian	100
Allensville, Mosely Pond	200	Lake Shannon	100
Anchorage, Reel's pond	20	Pretty Creek	†4,000
Blackey, Kentucky River, North Fork	60	Isabel, Sullivan's pond	200
Rock House Creek	60	Keithville, Colquitt's pond	90
Brandenburg, Adams's pond	100	Lake Charles, King's pond	20
Algood's pond	100	Leesville, Langton Mill Pond	30
Cain Pond	100	New Orleans, Westwego Lake	200
Dowden's pond	200	Oaklawn, Bayou Lacombe	400
Fontaine's pond	100	South Point, Irish Lake	400
Hunter's pond	200	Maine:	
Link's pond	100	Augusta, Kearns's pond	50
McIntire's pond	100	Livermore Falls, Tilton Pond	225
Moreman's pond (A)	100	Maryland:	
Moreman's pond (B)	100	Antietam, Antietam Creek	60
Reed's pond	100	Baltimore, Waxter Lake	120
Richardson's pond	100	Boring, Piney Run	120
Sims Pond	100	Bradshaw, Little Gunpowder Falls Creek	60
Butler, People's pond	40	Cumberland, Evitts Creek	100
Cadiz, Little River, Sinking Fork	500	Flintstone Creek	100
Campbellsville, Rice's lake	40	Potomac River	400
East View, Nolin River	40	Detour, Double Pipe Creek	40
Ekron, Albert Lake	100	Easton, Peach Blossom Creek	40
Clear Lake	100	Glencoe, Gunpowder River	150
Doe Run Creek	200	Grimes, Potomac River	80
Isaac Pond	100	Hagerstown, Antietam Creek	80
Lily Pond	100	Conococheague Creek	80
Sunrise Lake	100	Harmans, Blue Pond	20
Franklin, Peden Pond	200	Joppa, Oakdale Lake	20
Georgetown, Hall's pond	20	Keedysville, Antietam Creek	120
North Elkhorn Creek	40	Marlboro, Fair Association Lake	120
Glasgow, Baird's pond	100	Motters Station, Toms Creek	60
Jones's pond	300	Odenton, Rogues Harbor Creek	40
Gracey, Wilson Pond	100	Phoenix, Phoenix Pond	100
Greensburg, Green River	40	Salisbury, Leonard Mill Pond	40
Guthrie, Bland's pond	100	Seneca, Potomac River	*a* 700
Hodgenville, McDowell's pond	400	Smithsburg, Antietam Creek	40
Hopkinsville, Hayes Pond	200	Snow Hill, Purnell Pond	120
Kildav, Cumberland River, Clover Fork	60	Massachusetts:	
Kuttawa, Cumberland River	*a* 136	Graniteville, Burgess Pond	120
La Grange, Royal Inn Lake	20	Huntington, Little Galilee Pond	200
Lakeland, Hospital Lake	50	Lowell, Concord River	300
Louisville, Cedar Springs Lake	1,260	Flushing Pond	80
Floyds Fork	44	Hart Pond	155
Harrods Creek	44	Nabnassett Pond	80
McBrayer, Salt River	40	Plymouth, South Triangle Pond	140
Madisonville, City Lakes	400	Michigan:	
Mount Sterling, Bush Pond	40	Au Sable, Crooked Lake	150
Tipton's pond	20	Bellaire, Grass Lake	225
Munfordville, Green River	20	Channing, Silver Lake	60
Newport, Wirsch's pond	40	Charlotte, Narrow Lake	80
Otter Pond, Glover's pond	300	Clyde, Clay Lake	200
Paris, Airdre Lake	20	Crystal Falls, Erickson Lake	60
North Lake	40	Floodwood, Floodwood Lakes	60
Woodlawn Lake	20	Hart, Gilbert Lake	80
Xalapa Farm Pond	20	Juniper Pond	75
		Highland, Lakes in Oakland County	2,000

a Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1917—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.
Michigan—Continued.	
Houghton, Big Bayou	40
Hall Lake	60
Lake Roland	60
Snake River	40
Iron Mountain, Long Lake	60
Second Powder Lake	75
Trepanier Lake	40
Iron River, Chicagon Lake	170
Indian Lake	170
Jackson, Browns Lake	80
Jones, Bair Lake	80
Birch Lake	80
Driskell Lake	80
Poe's pond	40
Lakeland, Strawberry Lake	150
Leonard, Echo Lake	225
Marquette, Campan Lake	60
Echo Lake	60
Mud Lake	60
Vans Lake	60
Whetmore Lake	60
Whiteville Pond	80
Marshall, Lyon Lake	80
Mass, Courtney Lake	60
Metropolitan, Norway Lake	60
Six Mile Lake	60
Michigamme, Michigamme Lake	300
Negaunee, Forbs Lake	60
Northville, Walled Lake	80
Rockland, Nulhegan Pond	40
Sagola, Norway Lake	60
Scottville, Crystal Lake	80
Pere Marquette River	80
Sidnaw, Big Clearwater Lake	60
Long Lake	60
Loon Lake	60
Wolf Lake	60
South Branch, Jose Lake	225
South Range, Peters Lake	60
Three Oaks, Spring Lake	40
Toivola, Stamington Lake	60
Watersmeet, Duck Lake	170
Marion Lake	170
White Cloud, Long Lake	80
Winona, Ki-mit-a-wan-gag Lake	60
Witch Lake, Fence Lake	60
Long Lake	40
Lotta Lake	40
Woodland, Saddle Bag Lake	150
Minnesota:	
Brainerd, Wise's lake	500
Buffalo, Buffalo lake	100
Twin Lakes	340
Chisholm, Dewey-McCormick Lake	700
Degraff, St. Marys Lake	340
Detroit, Detroit Lake	425
Twin Lakes	75
Duluth, Camp Lake	400
Cook Lake	600
Spring Lake	75
Erskine, Spring Lake	75
Eveleth, Cedar Island Lake	500
Fairmont, Bud Lake	300
Hall Lake	400
Imogene Lake	400
Faribault, Willings Lake	300
Fertile, Olson Lake	340
Grand Lake, Sunset Lake	400
Grand Meadow, Deer Creek	400
Highland, Stewart Lake	500
Homer, Mississippi River	*a* 7,796
Knife River, Nigadoo Lake	400
Lake City, Lake Pepin	*a* 2,970
Lindstrum, Chesago Lakes	500
Little Falls, Fish Lake	400
Round Lake	300
Long Prairie, Lake Henry	425
Minnesota—Continued.	
Mahtowah, Park Lake	500
Menahga, Morgan Lake	340
Minneapolis, Lake Harriet	500
Lake of the Isles	500
Norwood, Hyde Lake	340
Owatonna, Beaver Lake	75
Park Rapids, Lake Itasca	510
Pelican Rapids, Lake Lizzie	520
Pipestone, Crooked Lake	200
Preston, Root River	500
Root River, North Branch	500
Root River, South Branch	100
Rochester, Lake Shady	500
Zumbro River, South Branch	500
Rollins, Bear Lake	400
Hardy Lake	75
Moose Lake	400
White Lake	400
St. Cloud, Nina Creek	255
St. Peter, Lake Emily	400
Lake Jefferson	450
Lake Washington	400
Turney, Schelin Lake	75
Underwood, Olson Lake	340
Wanless, Harriet Lake	75
Waseca, Goose Lake	300
Rice Lake	300
Walkins Lake	300
Winona, Biesanz's pond	200
Lake Winona	400
Mississippi River	*a* 4,690
Mississippi:	
Aberdeen, Baker Lake	35
Hatch Lake	†4,000
Old Glory Pond	225
Plantation Lake	†2,000
Roberts's lake	†3,000
Algoma, Moorman's pond	†1,000
Amory, Fuqua Lake	†2,000
Jandon Pond	500
Kinney Pond	†6,000 600
Artesia, Sclater's pond	†2,000 15
Becker, McCullen's pond	†2,000
Bogue Chitto, Big Creek	450
Booneville, Booneville Lake	†4,500
Mason's pond	45
Brandon, Ainsworth Mill Pond	†2,000
Buckatuma, Robinson's pond	75
Bude, Lake Snyder	1,000
Byram, Woods Pond	100
Calhoun City, Weeping Willow Pond	†1,000
Cedar Bluff, Belleview Pond	†2,000
Gillilan's pond	110
Sanders Lake	†2,000
Clinton, Harding's pond	500
Columbia, Reeves Lake	400
Columbus, Bylaw Lake	†3,000
Lake Katherine	†4,000
Corinth, Cane Creek Lake	†1,500
Clay Boone Lake	†1,500
Clear Lake	60
Dyer Lake	45
Hamlin Lake	45
Horn's pond	†1,500
Crawford, Pine Pond	15
Crystal Springs, Batton's pond	150
Bridgeville Lake	300
Palmer's pond	300
Slay's pond	450
Derma, Hutchins's pond	†1,000
Duck Hill, Oliver's pond	†2,000
Fayette, Corban's pond	1,000
Flora, Big Pond	†1,000
Gardner's pond	†1,000
Hopson's pond	200

a Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1917—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.
Mississippi—Continued.	
Friarspoint, Mississippi River	a 100
Greenville, Mississippi River	a 140
Grenada, Eureka Lake	400
Hattiesburg, Lumber Company Pond	†1,000
Hazlehurst, Hargrave Lake	450
Norman's pond	450
Peel's lake	800
Tally Lake	450
High Point, Eubank's pond	†2,000
Harden's pond	†2,000
Jackson, Bailey Lake	†2,000
Emergency Pond	100
Long Lake	†2,000
McClelland's pond	†1,000
Magee's pond	†3,000
Rains's pond	†3,000
Spring Lake	†3,000
Watkins Lake	80
Kosciusko, Bailey Lake	125
Furr's pond	110
Moore's pond	25
Lexington, Willow Castle Lake	†1,000
Louin, Land's pond	†1,000
	500
McComb, Clear Creek Lake	400
Reeves's pond	1,000
McCool, Smith Pond	†1,000
Veal Lake	†3,000
Maben, Lunceford's pond	†2,000
Templeton's pond	†2,000
Macon, Flora's pond	15
Howards Lake	30
Meadow Lake	†2,000
Thomas's pond	15
Magnolia, Minnehaha Creek	1,000
Meridian, Queen City Pond	15
Sharpe Lake	†6,000
Mize, Butler's pond	†3,000
Smith's pond	200
Natchez, Field's pond	1,000
New Albany, Coker's pond	†1,000
Robbins Lake	†2,000
Robbins Pond	†2,000
Newton, Bounds's pond	1,000
Okolona, Club Lake	†2,000
Penn, Lake Marguerite	†4,000
Pheba, Champion's pond	†2,000
Philadelphia, Cox's pond	†1,000
King's pond	†1,000
Picayune, East Hobolochitto Creek	500
McLaughlin's pond	500
Smith's pond	1,500
Stockstill's pond	1,500
Tate's lake	1,500
Telle Pond	500
West Hobolochitto Creek	500
Pocahontas, Lane's pond	†3,000
Pearl River	†3,000
Riverside Pond	†2,000
Pontotoc, Moss Lake Pond	†1,000
Primrose Lake	†2,000
Port Gibson, Ellis Lake	1,500
Oil Works Pond	1,000
Roxie, Campbell's pond	1,000
Sallis, Clanton's pond	†2,000
Shuler's pond	†1,000
Scooba, Stewart's pond	†3,000
Sessums, Castle's pond	†1,000
Shuqualak, Anderson's pond	†1,000
Ivy's pond	†1,000
Perry's pond	†1,000
Steel's pond	†2,000
Spring Lake	†3,000
Starkville, Benton's pond	a 35
Fort Pond	110
Hamm's pond	†2,000
Mississippi—Continued.	
Starkville, Lewis Pond	†2,000
	100
McCright's pond	†3,000
Old Scout Club Lake	†3,000
Pearson's pond	†1,000
Saunder's pond	110
Valley Hill Pond	†1,000
Stratton, Cleveland's pond	†1,000
Summerland, Gambrel's pond	†2,000
Sumrall, Miller's pond	†2,000
Tomnolen, Watson's pond (A)	110
Watson's pond (B)	†2,000
Watson's pond (C)	†2,000
Tupelo, Clover Lake	500
Dozier's pond	25
Lake View	1,000
Lespedeza Pond	500
Riley's pond	1,000
Yates's pond	50
Union, Jersey Brook Farm Pond	250
Tidwell's pond	†1,000
	500
Utica, Broome's pond (A)	1,000
Broome's pond (B)	500
Fulgham's pond	500
Water Valley, Kelley's pond	†4,000
Shannon Mill Pond	†2,000
Trusty's pond	†2,000
Woodville, Sessions's pond	1,000
Missouri:	
Aurora, Flat Creek	†450
Baring, Baring Lake	90
Bunceton, Petite Saline Creek	300
Cabool, Indian Creek	210
Piney River	280
Roubidoux River	280
Calhoun, Tibo Creek	140
Chilhowee, Casey Lake	450
Cottonwood Lake	200
Honey Creek	450
Clinton, Fish Lake	750
Shirt Lake	450
Crane, Lancaster Lake	140
Deepwater, Dickey Lake	140
Dodson, Oakwood Lake	590
Ferguson, Wabash Club Lake	280
Fortescue, Big Lake	400
Higginsville, Tyler Spring Pond	150
Holmes Park, Bass Lake	400
Independence, Bitter Sweet Lake	500
Cliff Lake	500
Compton Lake	1,000
Dickinson Lake	300
Harris's pond	400
Jasper, Possum Creek	200
Joplin, Bunce's pond	400
Five Mile Lake	450
Thomas Lakes	200
Kansas City, Lake of the Woods	600
Rookwood Pond	300
Shadow Lake	600
Lamar, Gregory Lake	200
Muddy Creek	600
Spring River, North Fork	900
Wilson's pond	150
Lanagan, Big Sugar Creek	450
Lebanon, Browns Lake	150
Gasconade River	400
Lisle, Lisle Lake	300
Marceline, Santa Fe Lake	210
Nevada, Katy Allen Lake	450
Radio Springs Lake	600
West Lake	450
Noel, Elk River	140
Northview, James River	286
Odessa, Lake Venita	210

a Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1917—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.
Missouri—Continued.	
Pleasant Hill, Anglers Club Lake	200
Bond's lake	650
Leonards Lake	450
Smith Lake	450
Saginaw, Morsman Lake	†500
St. James, Meramec River	600
Sedalia, Spring Fork Creek	200
Slater, Alton-Slater Pond	343
Cattail Lake	200
Warrensburg, Willow Lake	200
West Plains, Spring River, tributary of	240
Willow Springs, Frisco Lake	360
Windsor, Wilkerson Park Club Pond	600
Montana:	
Bynum, Muddy River	500
Stukey's pond	300
Forsyth, Yellowstone River	7,500
New Hampshire:	
Keene, Spofford Lake	160
Newport, Rockybound Pond	225
New Jersey:	
Branchville, Culver Lake	400
Camden, Willow Grove Lake	400
Cranford, Bloodgood Pond	200
Newfoundland, Green Pond	400
Picatinny, Picatinny Lake	400
Plainfield, Holly Park Lake	300
Seeley Pond	300
Princeton, Carnegie Lake	800
Ridgewood, Saddle River	400
Trenton, Hutchinson Lake	600
New Mexico:	
Abbott, Abbott Lake	120
Alamillo, Alamillo Lake	75
Isla Pond	25
San Acacia Lake	75
Chama, Canones Lake	90
Clayton, El Rito Lake	50
Engle, Engle Lake	200
Faywood, Warm Springs Pond	150
Lakewood, Lake McMillan	100
Las Vegas, Asylum Lakes	50
Gallegos Pond	40
Maxwell, Lagonia Medara Lake	75
Lake Thirteen	75
Onava, Armstrong Lakes	75
Deep Lake	75
Raton, Throttle Pond	50
Roswell, Club Lake	25
Santa Fe, Arroya Hondo Lake	25
Tesuque Lake	25
Santa Rita, Harris's pond	150
Taos, Marez's pond	80
Thoreau, Indian Pond	25
New York:	
Altamont, Normankill Creek	300
Thompson Lake	600
Warner Lake	300
Au Sable, Fern Lake	300
Selmer Lake	200
Bridgehampton, Long Pond	200
Cambridge, Hedges Lake	400
Lake Lauderdale	400
Clymer Station, Clymer Pond	200
Eaton, Hatches Lake	400
Hopkins Lake	400
Ellenville, Ulster Lake	400
Fulton, Lake Neahtawanta	400
Gansevoort, Old Chase Pond	200
Greenwood Lake, Greenwood Lake	400
Hannibal, Glendale Pond	200
La Grangeville, Beechmont Pond	200
Lake Mahopac, Kirk Lake	500
Little York, Goodale Lake	400
Little York Lake	400
Lyons, Ganargua Creek	400
Pine Bush, Shawangunkkill Creek	300
New York—Continued.	
Randolph, Stillwater Pond	100
Red Creek, Blind Sodus Bay	400
Salisbury, Beaverdam Lake	400
Thompsons Ridge, Plattekill Creek	200
Shawangunkkill Creek	300
Troy, Three Lakes	400
Tully, Tully Lake	400
North Carolina:	
Aberdeen, Maries Pond	400
Millies Pond	800
Angier, Gardner's pond	600
Ashboro, Parker's pond	75
Benson, Hall's pond	25
Stephenson's pond	†1,000
Bowie, New River	60
Old Field Creek	15
Brevard, Bridge Creek	†500
Tucker Creek	†500
Cameron, Crane Creek	30
Cary, Holleman's pond	†1,000
Chalybeate, Spence's pond	450
Charlotte, City Park Pond	400
Grandy's pond	400
Lakewood Park Lake	400
Orr's pond	400
Clarkton, Dutch Branch Pond	300
Clayton, White Oak Pond	30
Climax, Coblers Pond	250
Concord, Allison Pond	600
Dutch Buffalo Creek	600
Conway, Watson's pond	400
Doughton, Doughton Creek	45
Dunn, Great Coheria Pond	1,200
Jernigan's pond	400
Edenton, Queene Anne Creek	6,000
Elkin, Bugaboo Creek	†500
Carter Falls Pond	†500
Elkin Creek	†500
Yadkin River	†500
Ellerbe, Bells Creek Pond	2,000
Howell's pond	1,500
Mountain Creek	2,000
Elm City, Moore's pond	300
Enfield, Sycamore Pond	400
Fayetteville, Beaver Lake	†2,400
Little Rockfish Pond	†2,500
Mill Pond	†2,400
Sand Hill Pond	45
Franklinton, Wilder's pond	15
Fuqua Springs, Powell's pond	†1,300
Greensboro, Hamburg Mill Pond	1,000
Little Alamance Creek	30
Monroe's pond	15
Pinedale Pond	30
Hendersonville, Hayne's pond	†1,000
Jordan's pond	†500
Lake Wajaw	†500
Penny's pond	†500
Hickory, Baker Mountain Ponds	†500
Catawba River	†500
Catawba River, Jacobs Fork	†500
Gunpowder Lake	45
Hillsboro, Eno River	500
Jackson Springs, Harris's pond	1,500
Kinston, Sitterson's pond	30
La Grange, Bear Creek Pond	1,000
Sutton's pond	600
Laurel Hill, Pate's pond	400
Leland, Pennys Pond	600
Lilesville, Cloud Lake	450
Harris's pond	400
Littleton, Warren Pond	30
Louisburg, Tar River	25
Marshville, Fennell Pond	200
Flow Pond	400
Griffin View Pond	200
Hargett's pond	400
March's pond	400

Distribution of fish and eggs, fiscal year 1917—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.
North Carolina—Continued.	
Monroe, Austin's pond	400
Fairview Pond	200
Grassy Island Pond	400
Simpson's pond	200
Morrisville, Sorrell's pond	15
Sycamore Creek	800
Murphy, Hanging Dog Creek	500
New Bern, Hancock Creek	600
Trent River	500
New Hill, Maple Branch Pond	†1,000
Old Fort, Catawba River	†500
Oriental, Dawson Creek	45
Green Creek	300
Pendleton, Stephenson-Sykes Mill Pond	1,000
Pilot Mountain, Dodson Mill Pond	360
Pineville, Little Steel Creek	25
Raeford, Juniper Creek	200
Raleigh, Batts's pond	400
Rockingham, Covington's pond	400
Leak Pond	400
Ledbetter Pond	600
Marks Creek	800
Pee Dee Mill Pond	600
Sleeter Mill Pond	400
Speed Creek Pond	700
Roduco, Jones Mill Pond	400
Rougemont, Bowling Mill Pond	†500
Roxboro, Gregory's pond	†500
Hester's pond	25
Sanford, Carvington Pond	†1,500
Gonnella Pond	†1,500
Troynes Pond	†1,500
Shoals, Benbam Pond	250
Halls Pond	†500
Kittle Creek	†500
Matthews's pond	†500
Shoals Creek	†500
Spout Springs, Mill Pond	500
Statesville, White Oak Pond	15
Sunbury, Cross Mill Pond	500
Sylva, Tuckaseigee River	†500
Tarboro, Lake Parker	900
Tar River	75
Wake Forest, Caddell's pond	600
Warsaw, Cooper Mill Pond	600
Nahunga Club Pond	600
Waxhaw, Six Mile Creek	100
Whiteville, White Pond	150
Wilmington, Buena Vista Pond	200
Orton Pond	500
Wingate, Stewart's pond	30
Winston-Salem, Waterworks Pond	500
North Dakota:	
Bottineau, Lake Francis	400
Pelican Lake	300
Rude Lake	300
Devils Lake, Court Lake	250
Devils Lake	750
Freshwater Lake	250
Hettinger, Buckhorn Lake	100
St. John, Crow Lake	200
Fish Lake	300
Garber Lake	300
Hill Lake	300
Loon Lake	200
Oak Lake	300
Osland Lake	200
Pelican Lake	200
Shutte Lake	200
Snavely Lake	300
Sucker Lake	300
Warner Lake	200
Waukepa Lake	300
Willow Lake	200
Ohio:	
Akron, East Lake	500
Bellaire, Captina Creek	50
Holloway Pond	15
Ohio—Continued.	
Berea, Deer Quarry Pond	200
Cambridge, City Lake	225
Tin Mill Pond	25
Canton, Meyers Lake	300
Carey, Fish Club Lake	400
Chillicothe, Paint Creek	400
Paint Creek, North Fork	280
Chippewa Lake, Chippewa Lake	500
Cincinnati, Lake Kaelin	120
Mill Creek Lake	40
Cleveland, Bass Lake	300
Punderson Lake	300
Snow Lake	300
Covington, Stillwater River	25
Crestline, Sandusky River	300
Dayton, Burkhardt's pond	120
Lewisburg, Miller Fork Creek	195
Twin Creek	260
Logan, Clear Fork Creek	75
Scott Creek	75
Mansfield, Brubaker Creek	200
Clear Fork Creek, North Branch	300
Clear Fork Creek, South Branch	300
Fergeson Creek	200
Kohiser Creek	200
Rocky Fork Creek	300
Stevenson Run	100
Whetstone Creek	400
Marietta, Duck Creek	75
Little Muskingum River	75
Millersburg, Killbuck River	75
Ney, Mason's pond	100
Oak Harbor, Portage River	300
Piqua, Spring Creek	50
Quaker City, Wills Creek	75
Randall, Sand Rock Pond	200
St. Marys, Lake St. Marys	125
Shelby, Huron River	300
Mohican River, Black Fork	300
Sidney, Tanawa Lake	75
Swifts, Muskingum River	75
Tiffin, Mohawk Club Lake	500
Troy, Honey Creek	75
Spring Creek	150
Unionville, Rock's pond	100
Wapakoneta, Auglaize River	75
Grand Lake	100
Washington Court House, Carman's pond	80
Clouser's pond	40
Paint Creek, East Fork	80
Rattlesnake Creek	80
Sugar Creek	120
Wellington, Waterworks Pond	200
Woodsfield, Little Muskingum River	60
Sunfish Creek	60
Yellow Springs, Neff Park Lake	120
Youngstown, Bears Den Creek	200
Big Yankee Creek	200
Indian Creek	100
Lake Cohassett	500
Lake Glacier	200
Mill Creek	200
Zanesville, Licking River	100
Muskingum River	100
Oklahoma:	
Afton, Fuser Lake	50
Alva, Lake Ashley	65
Ardmore, Boucher's pond	20
Club Lakes	80
Dicks Lake	40
Sandlin Lake	40
Wortham Lake	40
Armstrong, Hatchery Ponds	70
Big Cabin, Mustang Creek	40
Rock Creek	40
Bison, Meadowbrook Pond	60
Blocker, Blue Lake	20

Distribution of fish and eggs, fiscal year 1917—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.
Oklahoma—Continued.	
Broken Bow, Dierks Lake	150
Yasha Lake	150
Byars, Porter-Newbern Lake	40
Carter, Anderson's pond	65
Centrahoma, Hall's pond	20
Chattanooga, White's pond	40
Chickasha, Country Club Lake	180
Shawnee Springs Lake	60
Sheds Lake	120
Choteau, Adkins Lake	20
Clinton, Clinton Pond	65
Coalgate, Jamie Lake	40
Coleman, Owens Lake	20
Comanche, Lake Eveline	40
Willow Pond	40
Davis, Freeman's pond	120
Duncan, Doaks Lake	40
Payne's pond	80
Durant, Blanchard's pond	20
El Reno, Redder's pond	60
Target Creek Lake	60
Wolf Pond	60
Woods Lake	60
Erick, Bull Creek	65
Everett's pond	65
Haddock's pond	65
Minnow Creek	65
Ram Hollow Creek	65
Terrell Lake	65
Turkey Creek	65
Eufaula, Eufaula Lake	40
Featherston, Sunnyslope Lake	40
Francis, Oliver Lake	40
Geary, Senn's pond	65
Granite, Williams's pond	40
Guthrie, Cedar Lake	48
Ellison Lake	48
Highland Lake	48
Lake Corson	48
Santa Fe Lake	48
Spring Lake	48
Williamson Lake	48
Heavener, Poteau River	60
Poteau River, Black Fork	40
Hydro, Southview Pond	80
Kingfisher, Kingfisher Creek	120
Kiowa, Kiowa Katy Lake	60
Krebs, Shannon Lake	40
Lawton, Highland Lake	40
Lake Karl	80
Wiedeman Lake	80
Lequire, Mountain Fork Creek	40
Lone Wolf, King's pond	40
McAlester, Club Lake	40
Dow Lake	40
Lake McAlester	40
McAlester's lake	20
Twin Buttes Lake	20
Marietta, Club Lake	40
Hovenkamp Lake	40
Medford, Evans's pond	60
Goldy Pond	60
Weld Lake	60
Muldrow, Shepherd's pond	20
Muskogee, City Park Lake	60
Sondheimer Lake	20
Vanns Lake	40
Nowata, Tillottson Lake	20
Ochelata, Scott's pond	20
Ottawa, Five Mile Creek	20
Pauls Valley, Adams's pond	40
Democrat Pond	40
Republican Pond	80
Sherrill's pond	40
Training School Pond	40
Perry, City Lake	48
McKinstry Lake	48
New City Lake	48
Oklahoma—Continued.	
Pond Creek, Coldwater Creek	120
Crooked Creek	120
Pond Creek	120
Sand Creek	120
Poteau, Horseshoe Lake	80
Purcell, Johnston's pond	40
Rocky, Wilburn's pond	65
Sayre, Clear Lake	40
Price's pond	40
Sharon, Persimmon Lake	130
Shattuck, Ivanhoe Lake	325
Texola, Brushy Creek	65
Howard's pond	65
Speed's pond	195
Tishomingo, Northside Lake	20
Spring Lake	20
Tulsa, Sand Springs Park Lake	40
Vinita, Hawkins's lake	40
Little Cabin Creek	40
Locust Creek	40
Watts, Illinois River	60
Weatherford, Cobb Creek	65
Pennsylvania:	
Arcola, Perkiomen Creek	300
Atglen, Glennville Pond	400
Bedford, Juniata River, Raystown Branch	115
Bryn Mawr, Earle's pond	200
Cambridge Springs, Conneautee Lake	150
Drakes Pond	100
Edinboro Lake	300
Christiana, Johnson Run	200
Octoraro Creek	600
Collegeville, Perkiomen Creek	300
Columbia, Little Chickies Creek	300
Confluence, Youghiougheny River	140
Conneaut Lake, Conneaut Lake	400
Corry, Bear Lake	200
Brokenstraw Creek	200
Coffee Creek	200
Columbus Pond	200
French Creek	200
Denver, Buchers Run	100
Lesher Pond	200
Muddy Creek	200
Stony Run	200
Dillsburg, Bermudian Creek	75
Eagles Mere, Eagles Mere Lake	600
East Freedom, Bulls Creek	50
East Greenville, Perkiomen Creek	100
Easton, Saylors Lake	500
Ephrata, Hammer Creek	200
Everett, Juniata River, Raystown Branch	500
Falls, Susquehanna River, North Branch	150
Fishertown, Dunnings Creek	225
Flowing Spring, Juniata River	300
Gaines Junction, Pine Creek	50
Ganister, Juniata River, Frankstown Branch	300
Gettysburg, Conewago Creek	100
Graterford, Perkiomen Creek	200
Green Lane, Perkiomen Creek	200
Haines, Susquehanna River	400
Hendricks, Perkiomen Creek	200
Holtwood, Tucquan Lake	300
Horrell, Juniata River	300
Indian Creek, Indian Creek	45
Johnstown, Quemahoning Lake	400
Kempton, Maiden Creek	300
Kratz, Perkiomen Creek	200
Lancaster, Bushong Pond	20
Conestoga Creek	400
Conestoga Valley Pond	20
Hunsecker Pond	20

Distribution of fish and eggs, fiscal year 1917—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.
Pennsylvania—Continued.	
Lancaster, Mill Creek	200
Paper Mill Pond	20
Susquehanna River	500
Umbles Pond	20
Waterworks Pond	20
Langhorne, Neshaminy Creek	300
La Plume, Kewanee Pond	50
Manataka Pond	50
Lewisburg, Buffalo Creek	75
Little Buffalo Creek	50
Spruce Run	50
Lititz, Lower Hammer Creek	200
Lower Reese, Juniata River	300
McLeans, Perkiomen Creek	200
Manheim, Chickies Creek	300
Manns Choice, Juniata River, Raystown Branch	95
Meadville, Cussewago Creek	150
French Creek	150
Woodcock Creek	150
Middleburg, Middle Creek	100
Penns Creek	125
Mill Creek, Saddler Creek	150
Minersville, Crystal Pond	75
Long Pond	50
Mar Lin Lake	50
Nanty Glo, Black Lick Creek	50
Narvon, Conestoga Creek	160
Neff Station, Juniata River	225
New Oxford, Beaver Creek	25
Conewago Creek	50
Newtown, Neshaminy Creek	700
Oaks, Perkiomen Creek	400
Palm, Perkiomen Creek	100
Pennsburg, Perkiomen Creek	100
Pequea, Pequea Creek	300
Tucquan Lake	300
Perkiomenville, Perkiomen Creek	700
Petersburg, Hydro Lake	50
Shaver Creek	50
Pocono Summit, Pocono Lake	80
Point View, Juniata River	300
Quarryville, Beaver Creek	200
Conowingo Creek	200
Octoraro Creek	200
Stewart Creek	200
Rahns, Perkiomen Creek	200
Reading, Beaver Creek	600
Red Hill, Perkiomen Creek	200
Roaring Springs, Yellow Creek	50
Rockmere, Allegheny River	500
Rohrerstown, Conestoga Creek	300
Royersford, Valley Lake	100
Rushland, Neshaminy Creek	400
Salford, Perkiomen Creek	200
Schwenksville, Perkiomen Creek	200
Shenks Ferry, Susquehanna River	300
Shrewsbury, Codorus Creek, West Branch	75
Gunpowder River, branch of	75
Muddy Creek, branch of	75
Springboro, Lake Neva	200
Spring Mount, Perkiomen Creek	200
Stewartstown, Electric Pond	50
Telford, Perkiomen Creek, Northeast Branch	500
Towanda, Susquehanna River	100
Traymore, Little Neshaminy Creek	80
Warren, Allegheny River	300
Conowango Creek	300
Williamsburg, Juniata River	300
Williamsport, Loyalsock Creek	75
Lycoming Creek	75
Yerkes, Perkiomen Creek	300
York, Codorus Creek	100
Conewago Creek	100
Zeiglersville, Perkiomen Creek	200
South Carolina:	
Aiken, Anderson's pond	1,000
Barton Pond	1,500
Busch's pond	2,000
Craig's pond	500
Cushman's pond	1,500
Hendrix Pond	2,000
Anderson, Lake Sycamore	800
Six and Twenty Pond	800
Angelus, Rocky Creek Pond	1,500
Ashley Junction, Goose Creek	1,500
Barnwell, Lower Three Runs	1,000
Batesburg, Boatwright's pond	500
Belton, Belton Mills Pond	750
Blaney, White Pond	2,500
Branchville, Smoak's pond	450
Cameron, Ulmer's pond	1,000
Charleston, Goose Creek Pond	2,250
Chesterfield, King's pond	1,000
Childs, Gills Creek	150
Clinton, Wright's pond	125
Clio, Bennett's pond	450
Clover, Clinton Pond	800
McCall's pond	800
Columbia, Crane Creek Pond	2,100
Dent Pond	3,500
Huffman's pond	2,100
Lowrance's pond	800
Messer Mill Pond	3,500
Nims Mill Pond	2,800
Snow Hill Pond	150
Darlington, Black Creek	300
Gilivon Mill Pond	150
Dorchester, Four Hole Creek	4,500
Drayton, Magnolia Garden Lake	2,500
Edgefield, Mays's pond	225
Embree, Edisto River	5,200
Fairforest, Fairforest Creek Pond	100
Fort Motte, Willard Mill Pond	1,500
Gaffney, Jolly's pond	800
Gaston, Guignard's pond	150
Gilbert, Black Creek	1,000
Graniteville, Graniteville Pond	900
Great Falls, Catawba River	2,400
Green Pond, Laurel Lake	900
Greenville, Clairmont Lake	200
Dilsy Lake	125
Enoree River	200
Gilder Creek	150
Paris Mountain Lake	150
Saluda River	125
Guess, Gulledge Pond	1,000
Hartsville, Black Creek Lake	2,500
Clyde Pond	1,500
Johnson Pond	1,500
McIntosh Mill Pond	1,500
Segar Pond	1,500
Hagood, Rafting Creek Pond	1,200
Hellams Crossing, Reedy River, branch of	1,200
Hickory Grove, Clark Fork Creek	2,400
Ingleside, Ingleside Lake	750
Smith Lake	600
Iva, Strickland's pond	400
Johnston, Edisto Lake	600
Watson's pond	600
Laurens, Cox Creek	125
Lexington, Dooly-Shull Pond	1,500
Twelve Mile Creek	150
Mayo, Buck Creek	1,200
Mount Croghan, Burch's pond	1,500
Ingleside Pond	500
Ninety Six, Meadow Branch	1,600
Orangeburg, Brantley's pond	1,700
Edisto River	5,000
Felder's pond	200
Fersner's pond	25
Fogle's pond	200

Distribution of fish and eggs, fiscal year 1917—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.
South Carolina—Continued.	
Orangeburg, Great Branch Pond	48
Limestone Creek	600
Orchard Park Pond	900
Smoak's pond	1,000
Ulmer's pond	1,200
Woodsville Pond	50
Patrick, Bear Creek Pond	1,500
Tolbert's pond	1,000
Rayflin, Gantt's pond	150
Ridge Spring, Yonce's pond	300
Rockton, Castles's pond	400
Ruby, Moore's pond	500
St. Matthews, Millwood Pond	325
Salley, Cooper's pond	1,000
Seneca, Cane Creek	500
Coneross Creek	300
Keowee River	300
Little River	300
Martins Creek	450
Seneca River	300
Snow Creek	400
Sugar Creek	300
Sharp, Tompkins's pond	400
Summerton, Pine Grove Pond	300
Summerville, Engleside Lake	2,500
Timber Lake, Edisto River	3,500
Trenton, Lorick Pond	450
Warren Pond	300
Wagener, Cedar Creek Pond	1,500
York, Lanham Pond	1,200
South Dakota:	
Alpena, Lake Overland	200
Canton, Sioux River	530
Clear Lake, Clear Lake	500
Eureka, Lake Martell	450
Hot Springs, Palmer Lake	70
Huron, Lake Byron	175
Lake Cavour	105
Lake Andes, Lake Andes	280
Lemmon, Lemmon Lake	300
McCook, McCook Lake	400
Madison, Lake Madison	280
Midland, Hedman Lake	70
Pukwana, Red Lake	280
Rapid City, Spruce Pond	70
Virgil, Barnes's pond	200
Tennessee:	
Austral, Spring Creek	†2,000
Bear Creek Junction, Mining Company Ponds	60
Bolivar, Galloway's pond	80
Chapel Hill, Townsend Pond	1,000
Chattanooga, Lookout Lake	125
Pan-Gap Lake	†4,000
Round Lake	125
Cleveland, Wildwood Lakes	404
Coal Creek, Coal Creek	†500
College Grove, College Grove Creek	40
Cragie Hope, Turnbull Creek	1,500
Elkmont, Little River, East Prong	60
Fayetteville, Elk River	50
Mulberry Creek	1,500
Fordtown, Sinking Creek	†500
Franklin, Big Harpeth River	2,547
Leipers Fork Creek	1,047
Murphy Fork Creek	24
Ridley's pond	500
South Harpeth River	47
West Harpeth River	47
Goodlettsville, Connell's pond	1,000
Greenfield, Elam's pond	500
Hoods, Little River	†1,000
Howell, Cane Creek	1,500
Jacksboro, Town Creek	75
Jackson, Love's pond	†2,000
Knoxville, Beaver Creek	†1,000
McEwen, Hurricane Creek	100
Tennessee—Continued.	
McMinnville, Mountain Creek	50
Manchester, Brewer Creek	1,500
Duck River	1,500
Martell, Morton's pond	20
Martin, Harris Fork Creek	†4,000
Mud Creek	†4,000
North Obion River	†3,000 1,000
Mayland, Cooper Lake	150
Memphis, Arnold Lake	70
Mont Eagle, Laurel Lake	40
Murphreesboro, Stone River	1,000
Nashville, Brons Creek, Sugar Tree Branch	118
Cumberland River	48
Lake Clara	1,000
Radnor Lake	4,000
Norma, New River	†1,000
Oliver Springs, East Fork Creek	75
Poplar Creek	75
Ooltewah, Wolf Teaver Creek	150
Portland, Sinkhole Pond	25
Powder Springs, Flat Creek	125
Pulaski, Richland Creek	48
Quebeck, Pettitt's pond	75
Roan Mountain, Doe River	†500
Rockwood, Johnson's pond	†500
Whites Creek	†500
St. Bethlehem, Bourne Lake	140
Shelbyville, Duck River	1,260
Springfield, Holman Pond	1,000
Luton's pond	500
Red River, Sulphur Fork	1,548
Red River, West Fork	150
Tazewell, Chadwell Lake	20
Tellico Plains, Conasauga Creek	†4,000
Toone, Keller Lake	80
Wartrace, Wartrace Creek	1,500
Watertown, Fall Creek	150
Waverly, Buffalo River	2,000
Wetmore, Prendergast Lake	40
White Pine, Long Creek	†500
Winchester, Elk River	50
Willow Pond	1,000
Texas:	
Alvarado, Lake View	180
Axtell, Axtell Lake	1,850
Everman Lake	1,900
Belen, Young's pond	75
Bryan, Lakeview Pond	200
Round Lake	175
Caldwell, Volney Lake	200
Wilson Lake	800
Center Point, Guadalupe River	1,400
Clear Fork, Clear Fork Lake	300
Cleburn, Club Lake	420
Corsicana, Beeman Pasture Pond	800
Magnolia Ponds	4,800
Morse Pond	800
Orphans Home Pond	1,600
Texas Company Pond	1,600
Dallas, Harris Lake	300
Larkin's pond	500
Wah Hoo Club Lake	900
Denison, Randell Lake	1,500
Edmunds, Guy Lake	400
Fort Worth, Alta Vista Lake	1,250
Bear Creek Lake	250
Howser Lake	250
Lake Worth	1,250
Franklin, Lake Bernadine	600
Lake Meldune	500
Lake Mirage	575
Georgetown, Ganns Mills Lake	2,000
Grand Prairie, Martin Lake	250
Robbins's pond	250
Grandview, Country Club Lake	720
Granger, Parmaleo Lake	3,000

Distribution of fish and eggs, fiscal year 1917—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.
Texas—Continued.	
Greenville, Arnold's pond	500
Chapman's pond	500
Greenville Pond	1,500
Handley, Edrington Lake	200
Houston, Cross Ranch Lake	800
Pumpkin Lake	1,200
Round Lake	640
Wayside Lakes	316
Hubbard, Club Lakes	3,365
Waterworks Lakes	2,865
Kerrville, Guadalupe River	1,400
Paint Pond	700
Palmer Pond	700
Reagan Pond	1,400
Terrell Lake	700
Kyle, Pecan Pond	200
Lancaster, Club Lake	375
Grimes's pond	300
Manchuca, Golden Lake	400
New Braunfels, Comal River	4,300
Guadalupe River	1,580
Simmons Creek	1,400
Spring Branch	1,400
Palestine, Blue Lake	1,200
Broyles Lake	700
Phillips Lake	700
San Antonio, Blue Wing Lake	2,800
San Marcos, San Marcos River	5,000
Texarkana, Davis Lake	700
Kings Lake	4,200
T. S. & N. Lake	700
Thorndale, Gregory's pond	200
Johnson's pond	200
Uvalde, Anderson Lake	250
Frio River	775
Leona River	1,580
Nueces River	3,195
Two Mile Lake	595
Waco, Club Lake	1,000
Elm Lake	1,000
Fort Lake	1,200
Hickory Creek	1,200
Maupin Lake	1,200
Spring Lake	1,200
Waring, Guadalupe River	1,400
Welfare, Joshua Creek	1,400
Vermont:	
Essex Junction, Shelburne Pond	120
Hydeville, Lake Bomoseen	375
Virginia:	
Alberta, Sturgeon Creek Pond	300
Alleghany, Dunlap Creek	30
Ashland, Lucky Strike Pond	400
Luck's pond	300
Beaver Dam, Beaver Dam Lake	1,350
Thompson's pond	450
Bedford, Big Otter Creek	1,050
Silver Lake	700
Blackstone, Cellar Creek Pond	600
Brookneal, Clay's pond	400
Falling Creek	400
Turnip Creek	300
Buchanan, James River	60
Mill Creek	60
Byllesby, Crooked Creek	30
Knob Fork Creek	30
New River	30
Carterton, Clinch River	100
Cave Station, North River	45
Charlottesville, Maury's pond	15
Ravanna River, North Fork	15
Christiansburg, Poff Branch	1,050
Church Road, Williams Pond	30
Courtland, Edward's pond	1,000
Gray's pond	400
Danville, County Line Creek	600
Dispatch, Orapax Pond	15
Drakes Branch, Roanoke River	60
Eagle Mountain, James River	45
Virginia—Continued.	
East Radford, New River	60
Elliston, Roanoke River	90
Emporia, Three Creeks Pond	†3,000 400
Faber, Gay's pond	450
Farmville, Curdsville Mill Pond	60
Fort Defiance, Middle River	45
Fredericksburg, Downman's pond	30
Falls Mills Pond	50
Hick's pond	300
Little Whim Pond	30
Miller's pond	400
Gala, James River	45
Glen Allen, Chickahominy Pond	300
Chickahominy River	400
Clifton Pond	150
Gordonsville, Noble's pond	15
Rae's pond	300
Watkin's pond	400
Goshen, Big Calf Pasture River	45
Green Bay, Blankenship Mill Pond	75
Greenlee, James River	45
Guinea, Mill Hill Pond	25
Hanover, Mitchell's mill pond	900
Mount Pleasant Pond	400
Herndon, Wiehle Lake	50
Holcomb Rock, James River	45
Ivanhoe, Chestnut Creek	30
Cripple Creek	30
Poplar Camp Creek	30
Kernstown, Opequon Creek	15
Keswick, Bellagio Pond	1,350
Keysville, Morton's pond	30
Lightfoot, Jollys Club Pond	15
Happy Dell Pond	45
Louisa, Bucks Pond	15
Lynchburg, Campbell's pond	30
James River	240
Rockfish River	90
Max Meadows, Reed Creek	150
Midlothian, Grove Shaft Pond	100
Milford, Andrews Pond	400
Chandler's pond	100
Norge, Scimiron Pond	300
Whitaker Mill Pond	300
Pemberton, Flannagan's mill pond	60
Whiteville Pond	30
Penola, Camp Pond	25
Campbell's pond	25
Hickory Spring Pond	400
Reedy Mill Pond	300
Turner's pond	25
Petersburg, Lees Mill Pond	1,200
Providence Forge, Mallory's pond	800
Mirror Lake	15
Providence Pond	15
Randolph, Spring Lake	30
Rectortown, Goose Creek	15
Reusens, James River	60
Richmond, Broad Rock Pond	15
City Lake	30
Clarendon Lake	600
Coleman Pond	15
Ellerson's pond	30
Forest Park Lake	400
Lakeside Lake	1,015
Red Lake	400
Sledd Mill Pond	30
Tiller's pond	100
Watkins Mill Pond	400
Ringgold, Power's pond	400
Rocky Mount, Frying Pan Creek	30
Pig River	30
Roxbury, Captain Joes Pond	315
Charles City Pond	400
Parkinson's pond	300
St. Paul, Clinch River	200
Saltville, Holston River, North Branch	45

Distribution of fish and eggs, fiscal year 1917—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.
Virginia—Continued.	
Singer, Roanoke River	1,050
South Norfolk, Greenleaf Pond	400
Stephens City, Cedar Creek	15
Shenandoah River	15
Suffolk, Lake Drummond	800
Suiter, Walkers Big Creek	45
Swords Creek, Clinch River, Maiden Spring Fork	330
Sycamore, Owen Hunt Pond	30
Taylorsville, Dry Bridge Pond	200
Tazewell, Clinch River, West Fork	265
Woolf Creek	450
Toano, White Hall Pond	15
Waverly, Clark Pond	600
Wellville, Booth Pond	600
West Point, Goddin Pond	15
Holly Fork Pond	15
Old Dominion Lake	15
White House, Poplar Grove Pond	15
Williamsburg, Warburton's pond	300
Woodstock, Power Company Pond	15
Rush Pond	15
Stonewall Pond	15
West Virginia:	
Belington, Hawley Lake	100
Bramwell, Bluestone River	450
Simmons Lake	150
Camden on Gauley, Middlety Creek	200
Clarksburg, West Fork River	300
Clay, Buffalo Creek	100
Cotton Hill, New River	700
Cowen, Gauley River	200
Harrisville, Hughes River	100
Huntington, Twelve Pole Creek	600
Keyser, Cabin Run	100
New Creek	100
Patterson Creek	125
Logan, Guyandotte River	300
Mannington, Buffalo Creek	100
Martinsburg, Opequon Creek	150
Potomac River	200
New Martinsville, Fishing Creek	300
Oral, Oral Lake	700
Paw Paw, Cacapon River	150
Petersburg, Potomac River, South Branch	450
Romney, Potomac River, South Branch	300
Wisconsin:	
Bangor, Cedar Lake	300
Jenkins Pond	100
Ruland Pond	200
Baraboo, Dell Creek	100
Devils Lake	600
Fern Dell Lake	300
Mirror Lake	200
Pickerel Slough Pond	200
South Bay	300
Tims Pond	300
Twin Slough Pond	200
Barneveld, Ball Creek	150
Birnamwood, Bass Lake	200
Mayflower Lake	200
Tood Lake	200
Black River Falls, Morrison Creek, South Fork	400
Brokaw, Silver Creek	300
Butternut, Bass Lake	300
Cable, Bass Lake	300
Henry Lake	300
Rosy Lake	300
Twin Lakes	300
Cedarburg, Cedar Creek	300
Centuria, Bass Lake	300
Deer Lake	300
Half Moon Lake	300
Wisconsin—Continued.	
Centuria, Little Balsam Lake	300
Long Lake	300
Loveless Lake	200
Crandon, Sand Lake	300
Deer Park, Bear Trap Lake	300
Fish Lake	300
Long Lake	300
Donaldson, Clara Lake	200
Island Lake	200
Lost Lake	200
Moccasin Lake	200
Eagle River, Eagle Chain of Lakes	7,000
Elcho, Otter Lake	300
Fifield, McArthur Lake	300
Round Lake	200
Fond du Lac, Lake de Nevue	300
Twin Lake	300
Fountain City, Mississippi River	[a] 13,900
Galesville, Beaver Creek	300
Genoa, Mississippi River	[a] 500
Grand Rapids, Wisconsin River	1,950
Hartford, Mud Lake	400
Hayward, Amidon Lake	300
Bass Lake	200
Burssinger Lake	200
Chief River, North Fork	50
Couderay River	200
Crystal Lake	200
Deer Lake	200
Dunn Lake	150
Grafton Lake	200
Grindstone Lake	200
Gurno Lake	300
Horseshoe Lake	100
Lake Tobactic	100
Long Lake	150
McConnell Lake	200
Martin Lake	100
Phaquawong Lake	200
Phipps Pond	50
Potato Lake	200
Red Ike Lake	300
Tobactic River	200
Tyner Lake	200
Whitten Lake	300
Hazelhurst, Lake Katherine	400
Lake Kaubashien	400
Lake Seventeen	400
Independence, Elk Lake	500
Iron Mountain, Spread Eagle Lake	300
Kilbourn, Wisconsin River	400
La Crosse, Mississippi River	[a] 4,300
Ladysmith, Hemlock Lake	300
Kegama Lake	300
Lake Beulah, Lake Beulah	400
Lake Delavan, Lake Delavan	500
Lynxville, Mississippi River	[a] 500
Manitowoc, English Lake	200
Harps Lake	200
Hartlaub Lake	200
Hampton Lake	200
Schissell Lake	200
Silver Lake	200
Mattoon, Baker Lake	300
Mayville, Rock River	200
Mazomonie, Lake Marion	800
Mill Pond	1,200
Medford, Kohns Lake	300
Lake Thirty Two	300
Otter Lake	300
Twin Lakes	300
Mellen, Chub Lake	400
Le Land Lake	300
Little Lake	300
McCarthy Lake	300
Meeder Lake	300

[a] Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1917—Continued.

LARGEMOUTH BLACK BASS—Continued.

Disposition.	Number.	Disposition.	Number.
Wisconsin—Continued.		Wisconsin—Continued.	
Mellen, Moquak Lake	300	Sparta, La Crosse River	100
Penokee Lake	300	Leon Mill Pond	200
Potter Lake	300	Lower La Crosse River	400
Menomonie, Caryville Lake	100	McCoy Pond	100
Cedar Lake	100	Mill Pond	200
Doyles Lake	100	Newton Pond, Lower	200
Eighteen Mile Lake	100	Newton Pond, Upper	200
Goose Lake	100	Paper Mill Pond	200
Hay River	100	Perch Lake	200
Lake Menomonie	100	Shoemaker Pond	200
Manbeek Lake	100	Star Lake, Ballard Lake	400
Miller Lake	100	Stone Lake, Grindstone Lake	400
Moore Farm Lake	100	Runzel Lake	300
Mud Lake	100	Three Lakes, Butternut Lake	100
Pitt Lake	100	Cook Lake	100
Red Cedar River	100	Crooked Lake	100
Rowe Lake	100	Four Mile Lake	100
Stump Lake	100	Frog Lake	100
Wilson Lake	100	Little Moccasin Lake	100
Nashville, Dry Lake	300	Maple Lake	100
Norrie, Lake Gotoit	300	One Stone Lake	100
Mayflower Lake	300	Planting Ground Lake	100
Mud Lake	200	Range Line Lake	100
Park Falls, Big Bass Lake	200	Rice Lake	100
Butternut Lake	200	Round Lake	100
Little Bass Lake	200	Thunder Lake	100
Oxbow Lake	200	Town Line Lake	100
Pelican Lake	200	Tomahawk, Crystal Lake	200
Pike Lake	200	Deer Lake	200
Snow Lake	200	Lake Clara	200
Pembine, Belgium Lake	300	Mirror Lake	200
Lindquist Lake	300	Rice River	200
Phelps, Big Bass Lake	200	Somo River	200
North Twin Lake	200	Spirit River	200
Portage, Lake Swenson	300	Tomahawk River	200
Lake Wisconsin	500	Wisconsin River	200
Poynette, Mackenzie Mill Pond	200	Tomahawk Lake, Wind Pudding Lake	300
Prairie du Sac, Baraboo River	350	Trempealeau, Chain of Lakes	300
Readstown, Cutoff Creek	225	Mississippi River	[a]2,385
Deadwater Pond	150	Round Lake	300
Kickapoo River, Horseshoe Bend Branch	375	Union Grove, Eagle Lake	300
Kickapoo River, West Branch	375	Waupaca, Rainbow Lake	300
Reedsburg, Baraboo River	300	Wausau, Rib River	900
Rice Lake, Bear Lake	200	Winter, Bass Lake	300
Cedar Lake	200	Black Dan Lake	300
Deitz Lake	200	Wonewoc, Baraboo River	200
Devils Lake	200	Mill Pond	200
Ginder Lake	200	Peters Bay	200
Hemlock Lake	200	Rodgers Pond	200
Long Lake	200	Sand Pond	200
Shawano, Shawano Creek	100	Wolfenden Pond	200
Sheboygan, Goetzer Lake	300	Wyocena, Lake George	200
Sheboygan Falls, Cedar Lake	300	Mill Pond	200
Gerber Lake	300	Wyoming:	
Getzger Lake	300	Cheyenne, Lake Minnehaha	285
Pigeon Lake	300	Pearsons Lake	570
Somerset, Apple River	125	Sloans Lake	285
Bass Lake	200	Canal Zone: Ancon, Panama Canal	450
Sparta, Angelo Pond	300		
Bacon Pond	100	Total [b]	†320,050 961,912
Depot Pond	200		
Ginsline Pond	200		

SMALLMOUTH BLACK BASS.

Arkansas:		Colorado: Palmer Lake, Palmer Lake	200
Batesville, Spring Creek	90	Connecticut:	
DeQueen, Big Bear Creek	60	Greenwich, Peequo Lake	287
Elba, Little Red River	400	Plantsville, Plants Pond	100
Fayetteville, Clear Creek	80	Watertown, Long Meadow Lake	120
Mammoth Spring, Myatt Creek	100	Delaware:	
Spring River	100	Lincoln City, Reynolds Pond	500
St. Francis Station, St. Francis River	220	Wilmington, Belleview Pond	500
		Circle Pond	40

[a] Rescued from overflowed lands and restored to original waters.
[b] Lost in transit, 2,551 fingerlings.

Distribution of fish and eggs, fiscal year 1917—Continued.

SMALLMOUTH BLACK BASS—Continued.

Disposition.	Number.
Indiana:	
Edinburg, Sugar Creek	1,200
Greensburg, Big Four Lake	400
New Albany, Silver Creek	1,000
Shelbyville, Flat Rock River	400
Iowa: Delaware, Volga River	†3,000
Kentucky:	
Cadiz, Little River, Sinking Fork	1,400
Madisonville, Spring Lake	300
Munfordville, Green River	800
Louisiana: Natchitoches, Cane River	300
Maine:	
Machias, Hadley Lake	400
Oakland, Little Pond	600
Princeton, Big Lake	400
Lewey Lake	500
Long Lake	400
Readfield, Echo Lake	400
Maryland:	
Dickerson, Potomac River	*a* 100
Frostburg, Potomac River	120
Hagerstown, Antietam Creek	†12,000
Conococheague Creek	†12,000
Potomac River	†6,000
Selbysport, Youghiogheny River	120
Seneca, Potomac River	*a* 220
Massachusetts:	
Almont, Ames Lake	200
Meadow Lake	1,500
Boxford, Stevens Pond	†1,500
Lowell, Flushing Pond	†1,500
Hart Pond	†1,500
Tyngs Pond	†1,500
New Bedford, Long Pond	400
Mary Pond	300
Mattaporsett River	300
Snows Pond	300
Pepperell, Massapoag Lake	235
Pittsfield, Onota Lake	350
Pontoosuc Lake	480
Webster, Baker Pond	250
Carbuncle Pond	250
Chaubunagungamaug Lake	300
Haven Pond	250
Peter Pond	250
Michigan:	
Alpena, Devil Lake	†2,000
Grand Lake	†2,000
Hubbard Lake	†2,000
Athens, Clater Lake	†2,000
Kenyon Lake	†2,000
Lehr Lake	†2,000
Belding, Robsis Lake	300
Blissfield, Raisin River	250
Brighton, Baeteka Lake	†2,000
Charlotte, Narrow Lake	†2,000
Cheboygan, Twin Lakes	†4,000
Clarion, Walloon Lake	†5,000
Concord, Swains Lake	300
Dowagiac, Indian Lake	300
East Tawas, Indian Lake	†4,000
Elba, Riley Lake	†1,000
Grand Rapids, Lappin Lake	†2,000
Highland, Alderman Lake	†2,000
Bitten Lake	†2,000
Cundy Lake	†2,000
Downey Lake	†2,000
Duck Lake	†2,000
Dunham Lake	†2,000 250
Harvey Lake	†2,000
Long Lake	†2,000
Maxfield Lake	†2,000
Mud Lake	†2,000
Round Lake	†2,000
Whalen Lake	†2,000
Hillman, Brush Lake	†2,000
Round Lake	†2,000
Hillsdale, Baw-Beese Lake	250
Michigan—Continued.	
Holly, Simonson Lake	†2,000
Jackson, Browns Lake	†2,000
Gillett Lake	†2,000
Vandercook Lake	300
Kalamazoo, Crooked Lake	300
Lakeland, Huron River	†4,000
Lapeer, Lake Neppissing	†2,000
La Roche, Lake Ella	†2,000
Lake Nettie	†2,000
Manitou Beach, Devils Lake	600
Middleville, Thornapple River	†2,000
Milford, Round Lake	500
Oscoda, Van Etten Lake	†4,000
Owosso, Maple River	†2,000
Palmyra, Raisin River	250
Pentwater, Bass Lake	†2,000
Pontiac, Ox Bow Lake	†2,000
Richland, Miller Lake	†2,000
Romeo, Cusic Lake	†2,000
Rose Center, Hunniston Lake	†1,000
St. Louis, Pine River	125
St. Louis Pond	†4,000
South Branch, Lake Mio	†4,000
Red Head Lake	†1,000
Springport, Duck Lake	†2,000
Walled Lake, Walled Lake	†4,000
White Cloud, Crystal Lake	†2,000
Mast Pond	†1,000
Minnesota:	
Deerwood, Bay Lake	600
Duluth, Lake Antoinette	300
Knife River, Crooked Lake	100
Litchfield, Dunn Lake	300
Lake Minnebelle	300
Lake Ripley	300
Lake Stella	300
Lake Washington	300
Richardson Lake	300
White Bear, White Bear Lake	300
Missouri:	
Arlington, Big Piney River	400
Aurora, Flat Creek	†600
Cabool, Hog Creek	200
Kansas City, Alton Slater Pond	57
Lamar, Spring River, Muddy Branch	146
Mansfield, Bryant River	500
Merwin, Corbin's pond	200
New Hampshire:	
Antrim, Gregg Lake	500
Chesham, Silver Lake	400
Concord, Contoocook River	200
Plymouth, Loon Lake	300
New Jersey:	
Boonton, Consolidated Lake	100
Rock Peon Lake	100
Camden, Willow Grove Lake	500
Dover, Picatinny Lake	100
Shongum Lake	3,500
Hackettstown, Allamuchy Lake	100
Croton Lake	100
Guard Lock Pond	100
Hatchery Ponds	1,500
Newburg Pond	100
Lake Grennell, Lake Grennell	500
Morris Plains, Hospital Ponds	1,000
Patterson, Passaic River	125
Plainfield, Robinson Lake	1,400
Princeton Junction, Carnegie Lake	200
Saddle River, Connolly's pond	70
New York:	
Addison, Canisteo River	322
Amsterdam, Schoharie River	70
Batavia, Godfrey Pond	400
Horseshoe Lake	300
Binghampton, Chenango River	192
Susquehanna River	183
Cazenovia, Cazenovia Lake	200
Clemons, Long Pond	70

a Rescued from Chesapeake & Ohio Canal and restored to original waters.

Distribution of fish and eggs, fiscal year 1917—Continued.

SMALLMOUTH BLACK BASS—Continued.

Disposition.	Number.
New York—Continued.	
Cohoes, Mohawk River	150
Collins, Hospital Pond	102
Corning, Canisteo River	200
Chemung River	200
Cohocton River	200
Fonda, Middle Lake	50
West Caroga Lake	50
West Stink Lake	50
Glen Flora, Glen Lake	100
Gloversville, Canada Lake	70
Hamilton, Lebanon Pond	200
Woodman Pond	200
Harpursville, Susquehanna River	200
Lake Bonaparte, Lake Bonaparte	183
La Salle, Niagara River, Upper	300
Le Roy, Oatka Creek	300
Monsey, Saddle River	105
Moravia, Owasco Lake	204
Newark, Canarquea Creek	200
Niagara Falls, Niagara River	180
Norwich, Bracketts Lake	200
Chenango Lake	200
Chenango River	200
McDonough Lake	200
Meads Pond	200
Palmyra, Barge Canal	60
Campbell Pond	60
Mud Creek	60
Red Creek	60
Port Henry, Lake Champlain	150
Lake Wawonaissa	150
Rome, Bullhead Lake	61
Schenectady, Mariaville Pond	85
Syracuse, Cazenovia Lake	120
Cross Lake	580
Jamesville Pond	320
Otisco Lake	580
Skaneatles Lake	380
Truxton, Tioughniough River, East Branch	200
Utica, Risley Pond	100
North Carolina:	
Altapass, Emanuel's pond	†500
Brevard, French Broad River	†500
Lake Elvira	†500
Pickleseimer Pond	†500
Sapphire Lake	†500
Burlington, Glencoe Pond	†500
Haw River Pond	†500
Piedmont Lake	250
Piedmont South Lake	250
Scott Lake	†500
Connelly Springs, Alexander's pond	75
Ela, Soco Creek	†500
Four Oaks, Keens Pond	75
Hendersonville, Lake Wajaw	†500
Hot Springs, Shulin Creek	75
Spring Creek	75
Lake Toxaway, Lake Toxaway	†1,000
Lumberton, McAlester's pond	150
North Wilkesboro, Buffalo Creek	†1,000
Elk Creek	†1,000
Yadkin River, Lewis Fork	†500
Yadkin River, Stony Fork	†500
Princeton, Holt's pond	250
Raleigh, Milburnie Pond	†500
Myatt Pond	250
Ohio:	
Mentor, Morley Lake	300
Steubenville, Cross Creek	575
Yellow Creek	575
Pennsylvania:	
Arcola, Perkiomen Creek	250
Skippack Creek	500
Ariel, Lake Lacawac	200
Atglen, Octoraro Creek	180
Beech Creek, Bald Eagle Creek	183
Beech Creek	61
Benton, Susquehanna River	60
Pennsylvania—Continued.	
Biglerville, Conewago Creek	400
Bushkill, Deer Lake	150
Delaware River	354
Forest Lake	200
Lake Taminent	200
Butler, Glade Run	600
Little Creek	1,200
Rough Run	1,200
Thorn Creek	1,200
Chadds Ford, Patterson Pond	60
Cochranton, French Creek	200
Collegeville, Perkiomen Creek	250
Skippack Creek	500
Confluence, Youghiogheny River	400
Conneaut Lake, Conneaut Lake	700
Connellsville, Youghiogheny River	200
Dalmatia, East Mahantonga Creek	61
Susquehanna River	122
Doylestown, Neshaminy Creek	1,200
Tohickon Creek	1,000
East Greenville, Perkiomen Creek	250
Skippack Creek	250
Easton, Delaware River	620
Ellwood City, Connoquenessing River	150
Factoryville, Lake Sheridan	750
Falls, Lake Wynola	160
Franklin, Lake Emma	100
Sugar Creek	200
Frazer, Ridley Pond	500
Freedom, Brush Creek	61
Gettysburg, Big Marsh Creek	2,000
Graterford, Perkiomen Creek	250
Skippack Creek	500
Green Lane, East Swamp Creek	250
Skippack Creek	250
Hendricks, Perkiomen Creek	250
Skippack Creek	250
Jersey Shore, Pine Creek	122
Keisters, Slippery Rock Creek	80
Kratz, Perkiomen Creek	250
Skippack Creek	250
Lake Carey, Lake Carey	204
La Plume, Keewanee Pond	102
Manataka Pond	102
Lebanon, Ebenezer Pond	300
Grohs Pond	250
Little Swatara Creek	500
Lewisburg, Buffalo Creek	250
Lititz, Conestoga Creek	750
McLeans, Perkiomen Creek	250
Skippack Creek	250
Meadville, Cussewago Creek	200
French Creek	200
Woodcock Creek	200
New Castle, Neshannock Creek	1,400
Newport, Cocolamas Creek	250
Juniata River	1,250
New Ringgold, Rausch Lake	408
Oaks, Perkiomen Creek	250
Skippack Creek	500
Orwigsburg, Rausches Pond	500
Palm, Perkiomen Creek	125
Skippack Creek	125
Parkers Glen, Twin Lakes	200
Pennsburg, Perkiomen Creek	250
Skippack Creek	250
Perkiomenville, Perkiomen Creek	250
Skippack Creek	250
Phoenixville, French Creek	250
Perkiomen Creek	250
Pickering Creek	250
Stony Run	250
Pittston, Worden Creek Lake	500
Pocono Summit, Tobyhanna Creek	500
Tunkhannock Creek	75
Quakertown, Stover Pond	400
Rahns, Perkiomen Creek	250
Skippack Creek	500

Distribution of fish and eggs, fiscal year 1917—Continued.

SMALLMOUTH BLACK BASS—Continued.

Disposition.	Number.
Pennsylvania—Continued.	
Reading, Alleghany Creek	36
Angelico Creek	36
Bernhart Creek	40
Cacoosing Creek	36
Irish Creek	72
Manatawny Creek	36
Monocacy Creek	36
Ontelaunee Creek	36
Socany Creek	36
Wyomissing Creek	536
Red Hill, East Swamp Creek	250
Skippack Creek	250
Royersford, French Creek	500
Kimberton Pond	250
Salford, Perkiomen Creek	250
Skippack Creek	250
Schwenksville, Perkiomen Creek	250
Skippack Creek	500
Sellersville, Perkiomen Creek, Northeast Branch	800
Sewickley, Big Traverse Creek	61
Raccoon Creek	200
Sharpsville, Shenango River	280
Shaws, French Creek	208
Shenks Ferry, Susquehanna River	250
Ship Road, Forty Acre Pond	250
Ship Road Pond	250
Spring Mount, Perkiomen Creek	250
Skippack Creek	250
Stoyestown, Quemahoning Lake	120
Swengel, Penns Creek	250
Uniontown, Gorley's pond	102
West Chester, Brandywine Creek	500
White Haven, Lehigh River	750
Yardley, White Pond	800
Yerkes, Perkiomen Creek	250
Skippack Creek	500
Zeiglersville, Perkiomen Creek	250
Skippack Creek	500
Tennessee:	
Clarksville, Barton Creek	300
Little West Fork Creek	300
Red River	300
Cornersville, Richland Creek	300
Estill Springs, Rock Creek	300
Gallatin, Bledsoe Creek	300
Kingsport, Dolen Gap Lake	†500
Mitchellville, Big Davis Pond	200
Murfreesboro, Stoner River	300
Norma, New River	500
Okolona, Buffalo Creek	†500 250
Rock Island, Caney Fork River	1,140
Collins River	400
Springfield, Red River	300
Wartrace, Garrison River	1,200
Texas: Texarkana, Spring Lake	100
Vermont:	
Burlington, Lake Champlain	429
Joes Pond, Joes Pond	†3,000
Miles Pond, Miles Pond	100
Poultney, Lake St. Catherine	200
Rutland, Otter Creek	150
Virginia:	
Alexandria, Water Co. Reservoir	240
Ashby, Shenandoah River	†8,000
Balcony Falls, James River	165
Belmont, Goose Creek	†5,000
Broadway, Shenandoah River, North Branch	†6,000
Clifton, Bull Run	120
Goshen, Calf Pasture River	†6,000
Hot Springs, Jackson River	130
Lawyers, Flat Creek	120
Lynchburg, Odd Fellows Home Lake	240
Roanoke, Roanoke River	†6,000
Woodstock, Shenandoah River, North Fork	†10,000
West Virginia:	
Berkeley Springs, Sleepy Creek	240
Capon Springs, Great Cacapon River	†10,000
Charleston, Elk River	†8,000
Groves, Groves Creek	500
Huntington, Guyandotte River	1,110
Twelve Pole Creek	925
Marne, Elk River	1,000
Petersburg, Potomac River, South Fork	2,400
Porter, Elk River	†3,000
Raleigh, Piney River	†5,000
Shelton, Elk River	†6,000
Wellsburg, Buffalo Creek	2,600
Wisconsin:	
Amery, Lost Lake	300
Round Lake	300
Ashland, Bass Lake	300
Basswood Lake	300
Buck Hill Lake	400
Clear Lake	400
Crystal Lake	400
Duck Lake	300
Dupont Lake	400
Everett Lake	300
Ewen Lake	400
Finger Lake	400
Fish Lake	300
Lamal Lake	300
Long Lake	400
Lynch Lake	300
Mac-A-Nin-ny Lake	300
Phantom Lake	300
Pike Lake	300
Prentice Lake	600
Sawdust Lake	400
Siskowit Lake	400
Smith Lake	400
Spider Lake	400
Star Lake	300
Swan Lake	400
Twin Lake	400
Walker Lake	300
White River Lake	300
Athelstane, Elbow Lake	300
Birnamwood, Mud Lake	300
Burlington, Bohner Lake	300
Brown Lake	300
Butternut, Bass Lake	300
Bear Lake	300
Bullhead Lake	300
Butternut Lake	300
Schnur Lake	300
Turtle Lake	300
Cable, Bartlett Lake	300
Cable Lake	650
Flynn Lake	300
Lake Owen	300
Mud Lake	350
Perry Lake	350
Swede Lake	350
Swenson Lake	300
Darlington, Pecatonica River	900
Donaldson, Big Portage Lake	300
Chrystal Lake	300
Crooked Lake	300
Deer Lake	300
Dollar Lake	600
Donohue Lake	300
Little Portage Lake	300
Moon Lake	300
Round Lake	300
Spring Lake	300
White Bass Lake	300
Drummond, Ashland Lake	350
Asmuth Lake	300
Bass Lake	300
Beaver Lake	300
Black Lake	300
Club House Lake	300

Distribution of fish and eggs, fiscal year 1917—Continued.

SMALLMOUTH BLACK BASS—Continued.

Disposition.	Number.
Wisconsin—Continued.	
Drummond, Eau Claire Lake	350
Elliott Lake	350
First Bass Lake	350
Pigeon Lake	350
Rawlinson Lake	300
Robinson Lake	300
Second Bass Lake	300
Spring Lake	300
Ellis Junction, High Falls Pond	600
Glidden, Augustine Lake	300
Buck Lake	300
Deer Lake	300
Derringer Lake	300
Mud Lake	300
Muscalonge Lake	300
Summit Lake	300
Torrey Lake	300
Grandview, Jacobsen Lake	300
Pratt Lake	300
Spring Lake	300
Hayward, Ghost Lake	300
Hayward Lake	300
Hubbard Lake	300
Lost Land Lake	350
Perch Lake	350
Spring Lake	350
Teal Lake	350
Hudson, Burkhardt Lake	300
Lake Mallalieu	300
Ladysmith, Lake of the Woods	400
Mellen, Caroline Lake	300
English Lake	300
Lake Galilee	300
Wisconsin—Continued.	
Mellen, Larson Lake	300
Long Lake	300
Loon Lake	300
Mineral Lake	300
Taggett Lake	300
Mercer, Mercer Lake	900
Odanah, Bad Lake	300
Indian Lake	300
Park Falls, Bass Lake	300
Block House Lake	300
Gardner Lake	300
Hay Lake	300
Newan Lake	300
Oxbow Lake	300
Schnur Lake	300
Smith Lake	300
Pelican, Pelican Lake	300
Shawano, Shawano Lake	300
Soperton, Otter Lake	300
Stone Lake, Lac Court Oreilles	400
Whitefish Lake	400
Trevor, Cooper Lake	300
Twin Lakes, Lake Mary	330
Waupaca, Rainbow Lake	300
Wautoma, Eagan Lake	300
Johns Lake	300
Silver Lake	300
Wonewoc, Castle Rock Pond	300
Horseshoe Pond	300
Wyocena, Duck Creek	300
Total [a]	†237,600 149,837

ROCK BASS.

Disposition.	Number.
Alabama:	
Abbeville, Hutto's pond	150
Anniston, Blue Pond	300
Cane Creek	300
Morris Creek	300
Rock Creek	345
Simpson's pond	300
Birmingham, City Lake	40
Elba, Seary Old Mill Pond	500
Tanton Mill Pond	500
Newton, High Spring Pond	250
Arkansas:	
Bellefonte, Spring Pond	200
Conway, Owen Lake	350
Delight, Jackson's pond	300
DeQueen, Big Bear Creek	800
El Dorado, Meadowbrook Pond	300
Fayetteville, Clear Creek	450
Richland Creek	450
White River, West Fork	450
Harrison, Crooked Creek	1,000
Hope, Pleasure Lake	400
Magnolia, Atkins's pond	200
Aubry's pond	200
Mammoth Spring, Warm Fork Creek	403
Ozark, Conatser-Hill Pond	400
Franes Creek	600
Rottaken, Faulkner Lake	400
Ferguson Lake	400
Hills Lake	400
Ink Bayou	600
Rock Creek	600
Colorado:	
Colorado Springs, Lake Erin	300
Palmer Lake, Palmer Lake	100
Trinidad, Chaquaqua Creek	800
Georgia:	
Bellville, Brierwood Pond	150
Gignilliat's pond	150
Douglas, Vicker's pond	250
Lake Park, Smoke House Lake	600
Roswell, Maddox's pond	300
Social Circle, Lake Louise	250
Sunny Side, Darsey's pond	400
Old Pump Pond	400
Tifton, Sutton's pond	500
Illinois:	
Armington, Springvale Farm Pond	300
Belleville, Oak Pond	100
Orbon Lake	400
Dahlgren, Sullivan's pond	400
White Hall, White Hall Pond	400
Indiana:	
Blountsville, Acker's pond	150
Brownsburg, White Lick River	500
Goshen, Stone Lake	400
Greensburg, Quarry Pond	225
Huntington, Salamonie River	500
Lexington, Englishton Park Pond	200
Osgood, Hunter Pond	225
Sellersburg, Sunnyslope Pond	225
Tippecanoe, Roose's pond	150
Iowa:	
Edgewood, Honey Creek	300
Manchester, Maquoketa River	600
Kentucky:	
Brandenburg, Denton Pond	50
Cerulean, Little River, Muddy Fork	1,000
Danville, McRoberts's pond	50
Franklin, Harrington Pond	50
Fredinoa, Rice's pond	50
Hopkinsville, Little River	100

[a] Lost in transit, 1,317 fingerlings.

Distribution of fish and eggs, fiscal year 1917—Continued.

ROCK BASS—Continued.

Disposition.	Number.
Kentucky—Continued.	
Louisville, Floyds Fork	525
Harods Creek	525
Morganfield, Flournoy's pond	50
Munfordville, Green River	300
Shelby Gap, Gibson's pond	200
Louisiana:	
Clinton, Dilly's pond	600
Frierson, Frierson's pond	40
Gloster, Burford's pond	200
Homer, Gladney's pond	70
Lake Charles, King's pond	120
New Orleans, Aquarium	55
Maryland:	
Bradshaw, Marye's pond	200
Dickerson, Potomac River	50
Edgemont, Ball Hill Pond	100
Seneca, Potomac River	150
Woodbine, Mullinix's pond	100
Missouri:	
Aurora, Honey Creek	500
Ferguson, Wabash Club Lake	24
Jaudon, Grand River, tributary of	300
Rich Hill, Logan Lake	600
Rolla, Little Piney River	600
Middle Gasconade River	600
Montana: Myers, Walker Pond	200
New Mexico:	
Elida, Kornegay's pond	105
Roswell, Cottonwood Lake	50
New York:	
Garrison, Dole's pond	300
Huntington, Little Rosemary Pond	200
North Carolina:	
Bostic, Felton Pond	200
Chapel Hill, Richards Pond	150
Corinth, Buckhorn Falls Pond	600
Duncan, Baker's pond	600
Fayetteville, Bruton's pond	400
Guilford College, Jessup's pond	300
Lenoir, Clark Gold Mine Pond	1,000
Lumberton, McAllister's pond	400
Pittman's pond	600
Matthews, Renfrow's pond	400
Morrisville, Sycamore Pond	400
Old Fort, Camp Creek	600
Pee Dee, Blewett Falls Pond	3,000
Pittsboro, Hailbourn Pond	200
Ohio:	
Alexandria, Raccoon Creek	100
Bellaire, Fairpoint Pond	200
Belleville, Gatton's pond	100
Berea, Rocky River	600
Cambridge, Gillespie Lake	200
Rock Hill Pond	200
London, Ellsworth's pond	200
Mansfield, North Park Lake	700
Mantua, Meadowbrook Pond	200
Midland City, St. Joseph Pond	150
Newark, Licking River	900
Weinant's pond	200
Oneida, Sand Rock Pond	200
Plymouth, Huron River, East Branch	500
Rogers, Pine View Pond	100
Washington Courthouse, Parry's pond	200
Youngstown, Indian Creek	400
Oklahoma:	
Ada, Rushing's pond	200
Ardmore, Ardmore Club Lakes	800
Dings Lake	400
Wolverton Lake	400
Armstrong, Hatchery Ponds	80
Choteau, Adkins Lake	400
Davis, Freeman Lake	400
Fairview, Hill Top Lake	200
Supply, State Spring Pond	124
Wardville, Willow Pond	200
Pennsylvania:	
Doylestown, Tohickon Creek	300
Everett, Juniata River, Raystown Branch	800
Hanover, Browns Pond	150
Dicks Pond	300
Lilley Pond	150
Little Conewago Creek	300
Obold Pond	300
Plum Creek	300
Slagle Creek	150
Sellersville, Barndt's pond	300
Williamsport, Loyalsock Creek	450
Lycoming Creek	300
South Carolina:	
Anderson, Masters Pond	400
Clio, Eddy Pond	400
Welch Pond	400
Creston, Boggy Gully Pond	400
McBee, Horton's pond	400
Norwood's pond	400
Swift Creek	1,600
South Dakota: Virgil, McCreery's pond	200
Tennessee:	
Cowan, Boiling Fork Creek	200
Castleberry Branch	200
Fishery, Sinking Creek	2,800
Spring Branch	8,200
Gallatin, McGar's pond	150
Hollow Rock, Watkins Pond	70
McMinnville, Mountain Creek	120
Maryville, Webb's pond	600
Shelbyville, Duck River	150
Springfield, Red River, Elk Fork	200
Watertown, Fall Creek	600
Texas:	
Abernathy, Chililee Pond	100
Bastrop, Club Lake	900
Brady, Dutton's pond	150
Brenham, Club Lakes	1,465
Spring Lake	500
Brownwood, McChristy's pond	200
Denison, Templemeyer's pond	500
Edgewood, Oak Leaf Lake	200
Fredericksburg, Bierschwale's pond	100
Jacksonville, Churchill's pond	300
Devereux's pond	300
Douglas's pond	300
Forrest's lake	801
Grayard's lake	300
Morris's lake	300
Williamson's lake	300
La Mesa, Sherman Pond	150
Longview Jct., T. & P. Lake	50
Mineola, Wood Springs Pond	200
New Braunfels, Comal River	1,825
Paris, Clear Lake	150
Crystal Lake	150
Pleasanton, Martin's pond	150
San Antonio, West End Lake	500
Sherman, Club Lake	300
Grass Lake	200
Lily Pond	300
McElreath's pond	100
Mesquite Lake	300
Smith Pond	300
Terrell, Bond's pond	200
Lake Bell	300
Mallory Lake	300
Tyler, Chinquapin Lake	300
Hitts Mill Pond	300
Virginia:	
Clifton, Rhodes's pond	200
Dunn Loring, Cornell's pond	100
Eagle Mountain, Catawba River	600
Elliston, Roanoke River	600
Fagg, Roanoke River, North Fork	400
Greenwood, William's pond	150

Distribution of fish and eggs, fiscal year 1917—Continued.

ROCK BASS—Continued.

Disposition.	Number.	Disposition.	Number.
Virginia—Continued.		Virginia—Continued.	
Houston, Powell's pond	150	Starkey, Back Creek	400
Ironto, Roanoke River, North Fork.	500	Wytheville, Tates Run	300
Keysville, Glenn Spring Pond	200	West Virginia: Martinsburg, Baker Lake	1,500
Leesburg, Harper's pond	100	Wisconsin:	
Paces, Walton's pond	400	Bangor, Farrs Pond	80
Plains, Goose Creek	1,000	Genoa, Mississippi River	[a] 300
Proffit, Gale Hill Pond	150	Leslie, Bahner Branch	600
Randolph, Spring Pond	200	Lynxville, Mississippi River	[a] 300
Richmond, Harnish's pond	400	Canal Zone: Ancon, Panama Canal	500
Roanoke, Peters Creek	500		
Roanoke River	600		
Tinker Creek	400	Total [b]	91,742
Salem, Roanoke River	600		

WARMOUTH BASS.[a]

Illinois: Galena, Mississippi River	2,000	Iowa: Bellevue, Mississippi River	400

SUNFISH.

Alabama:		Alabama—Continued.	
Abbeville, Jack Creek	450	Elba, Cox Mill Pond	100
Martins Lake	750	Fawcett Lake	100
Alexandria City, Heflin Pond	50	Hudson Lake	100
Thomas Pond	50	Hudson Mill Pond	100
Aliceville, Crim Lake	300	Hurricane Pond	100
Anniston, Blue Pond	700	Kierce Mill Pond	100
Choccolocco Creek	300	Long Pond	100
Ashby, Merchants Pond	100	Page Mill Pond	100
Ashland, Mattison's pond	175	Power Company Lake	100
Athens, Crowson's pond	150	Sawyer Mill Pond	100
Bellemina, Mooresville Pond	150	Spinx Mill Pond	100
Billingsley, Nummy's pond	150	Sweetwater Creek	100
Birmingham, City Lake	25	Trazor Mill Pond	100
Edgewood Lake	600	Enterprise, Blancket Pond	200
Finch's pond	300	Center Head Pond	200
Hickman Pond	150	Eoline, Wyatt's pond	120
Munger's pond	300	Epes, Kimbrough's lake	150
Ritter Pond	300	Eufaula, Hatfield's pond	150
Shades Creek	900	Country Club Ponds	600
Borden Springs, Terrapin Creek	120	Dent's pond	80
Boswell, Boswell's pond	40	Fayette, Oak Ridge Pond	150
Brantley, Gilchrist's pond	200	Sipsey Creek	600
Johnson's pond (A)	200	Fays, Yarbrough's pond	150
Johnson's pond (B)	100	Florence, Weeden's pond	150
Johnson's pond (C)	200	Fort Payne, Edgewood Lake	150
Briarfield, Mahan Creek, Spring Branch	300	Wills Creek	750
Buffalo, Newman's pond	50	Garden City, Copeland Pond	150
Capps, Spivey Mill Pond	150	Glenwood, Branch Pond	200
Chatom, Big Bassett Creek	600	Goshen, Floyd's pond	150
Cherokee, Prides Lake	80	Sikes Mill Pond	200
Clanton, Mountain Lake	150	Grady, Tucker's pond	150
Clayton, Bush's pond	300	Grimes, Herrings Pond	150
Martin's pond	150	Headland, Black Pond	60
Tanyard Pond	150	Deep Spring Pond	150
Columbia, Blackshear Branch	150	Kirkland's pond	150
Clover Spring Branch	150	McNeill's pond	150
Hollywood Pond	150	Riley's pond	100
Cuba, McGowen's pond	300	Huntsville, Broadview Pond	150
Cullman, Cleere's pond	150	Jasper, Bankhead's pond (A)	300
St. Bernard Lake	150	Bankhead's pond (B)	450
Tucker's pond	150	Blackwater River	600
Dora, Hill Lake	150	Christian's pond	150
Vandiver's pond	150	Hall Lake	150
Elba, Buck Branch	100	Kennedy, Gum Spring Pond	150
Busch Branch	100	Kinston, Richardson's pond (A)	200
Cains Lake	100	Richardson's pond (B)	200
Cotton Lake	100	Lapine, Russell's pond	150

[a] Rescued from overflowed lands and restored to original waters. [b] Lost in transit, 400.

Distribution of fish and eggs, fiscal year 1917—Continued.

SUNFISH—Continued.

Disposition.	Number.
Alabama—Continued.	
Leighton, Lander's pond	150
ineville, Alexander's pond	175
Lake Mae	100
Lineville Lake	525
Smith's lake	200
Horne Lake	150
Livingston, Turner's pond	300
Loachapoka, Rowell's pond	150
Louisville, Fuqua's pond (A)	150
Fuqua's pond (B)	550
Hick's pond	150
Lime Spring Pond	100
Michele Branch	550
Lowndesboro, Reese's pond	150
Luverne, Cody's lake	250
Knights Pond	300
Mildred Lake	300
Wright's pond	450
Madison, Cave Spring Pond	80
Farmers Pond	80
Herring's pond	120
James Pond	80
Willow Lake (A)	120
Willow Lake (B)	300
Marion, Woodfin's pond	150
Montgomery, Candler's lake	120
Dixie Pond	150
Montgomery Lake	300
Three Mile Creek	120
Tyson's pond	150
Newton, Fireleads Pond	150
Oneonta, Black Warrior River	150
Eureka Home Pond	50
Sand Lake	50
Opelika, Thomas's pond	150
Opp, McDaniel's pond	550
Webster's pond	600
Orrville, Blount's pond	150
Oxford, Snow Creek	300
Patsburg, Spradley's pond	150
Pell City, Waite Dairy Farm Lake	150
Petrey, Fowler's pond	150
Phil Campbell, Smith Lake	100
Pinckard, York's pond	150
Pine Hill, Indian Creek	300
Sheffield's pond	150
Plantersville, Gay's pond	150
Prattville, Wingard's pond	150
Quinton, Lake Bankhead	300
River Falls, Cooper's pond	200
Roanoke, McCarter's pond	100
Ussery's lake	100
Roswell, Burge's pond	175
Round Mountain, Hendrix's pond	300
Seale, Chadwick's pond	120
Selma, Ward's pond	150
Stewart, Cumming's pond	150
Suggsville, Cedar Lake	400
Sulligent, Ogden's pond	300
Talladega, Boswell's pond	100
Talladega Creek	1,200
Tanner, Peck's pond	150
Tennille, Prestwood's pond	150
Three Notch, Davis's pond	100
Reynold's pond	100
Troy, Carter Pond	150
Cowart's pond	150
Henderson Lake	450
Lightfoot's pond	150
McLeod's pond	150
Northcutt's lake	450
Powell's pond	150
Thundering Springs Pond	300
Trussville, Wyldwood Lake	150
Tuscumbia, Mitchell's pond	150
Union Springs, Gholston's pond	150
Lee's pond	120
Martin's pond	150
Alabama—Continued.	
Uniontown, Cromer's pond	300
Foushee Pond	150
McCorkle Lake	450
Valley Head, Little River	300
Little River, West Branch	150
Verbena, Sandy Creek	300
Winfield, Aston's pond	150
York, Allison's lake	600
Arizona:	
Benson, Walnut Grove Farm Reservoir	300
Globe, Rosevelt Lake	3,700
Herford, High Lonesome Pond	300
Winkelman, Cook's lake	200
Arkansas:	
Arkadelphia, Arnold's pond	600
Aubrey, Snipes's pond	70
Black Rock, Black River	*a* 3,904
Daggett, Cache River	600
Earle, Hood Lake	1,500
Long Lake	1,500
Emerson, Spring Lake	1,000
Fayetteville, Clear Creek	2,000
White River, West Fork	2,000
Highland, Bell's pond	300
Junction City, Brown's pond	700
Magnolia, Baker's pond	400
Goode's pond	200
Hutchinson's pond	600
Spring Lake	1,000
Stevens's pond	200
West End Pond	200
Mammoth Spring, Warm Fork Creek	62
Many Islands, Myatt River	500
Nashville, Glendale Pond	1,000
Huddleston's pond	160
Williams's pond	1,500
Prescott, Bryson's pond	1,800
Rogers, Osage Creek	2,000
Rudy, Deden's pond	160
Stamps, Silver Maple Pond	1,500
Sulphur Springs, Lake Ark-Mo-Kan	1,000
Tuckerman, Layton Lake	1,000
Waldo, Rhodes's pond	2,000
Yellville, Matlock's pond	400
Colorado:	
Denver, Lakewood Lakes	30
Willow Pond	100
Dolores, Shane's pond	300
Fountain, Eureka Lake	100
Haswell, Blue Lakes	1,000
Loveland, Southside Lake	600
Morrison, Harriman Lake	200
Connecticut: Greenwich, Dommerich's pond	200
Delaware: Wilmington, Circle Pond	350
District of Columbia: Washington, Rhodment Lake	25
Florida:	
Alturas, Star Lake	400
Lady Lake, Lake Alice	600
Lake Mattie	600
Orlando, Lake Bertha	200
Georgia:	
Abbottsford, Maxwell's pond	100
Adairsville, Saylor's pond	50
Alamo, Kent's pond	300
Alston, Southside Pond	200
Ash Grove, Spring Lake	600
Atlanta, Candler's pond	400
Chattahoochee Club Lake	300
Head's pond	200
Lake Ivy	200
McClelland's pond	170
Athens, Brooks's pond	600
Augusta, Arnold's pond	600
Carmichael Pond	600
Avera, Clark's pond	400

a Rescued from overflowed lands and returned to original waters.

Distribution of fish and eggs, fiscal year 1917—Continued.

SUNFISH—Continued.

Disposition.	Number.
Georgia—Continued.	
Baxley, Speer's pond	400
Bellville, Black Pond	400
Kennedy's pond	400
Box Springs, Lake Samoki	600
Bremen, Buck Creek, Headwaters	200
Posey Pond	100
Brownwood, Kinchafoonee Creek	600
Wallers Mill Pond	400
Broxton, Leggett's pond	150
Vickers's pond	200
Buena Vista, Davis's pond	200
Cairo, Shiver Pond	450
Carrollton, Happy Hollow Pond	100
Cartersville, Pettits Creek	150
Clarkston, Morris's pond	100
Colbert, Carithers's pond	100
College Park, Heard Spring Pond	200
Comer, Bankhead Pond	100
Congers, Farmer's pond	200
Covena, Hall's pond	400
Crawfordville, Asbury's pond	100
Ogeechee River	1,350
Culloden Battle's pond	150
Cusseta, King's pond	100
Wynn's pond	150
Cuthbert, Crumbley's pond	200
Dallas, Griss Pond	150
Decatur, Akin's pond	300
Babashula Pond	200
Douglas, Lake Peterson	450
Sims's pond	300
Spring Head Pond	300
Touchton's pond	300
Vickers's pond	300
Ward's pond	300
Dublin, Dreamland Lake	200
Dunwoody, Nancy Creek, Headwaters	150
Elberton, Poplar Spring Pond	100
Whiteside's pond	100
Ellabelle, Black Creek	450
Ellaville, Dozier's mill pond	400
Montgomery Mill Pond	400
Usry's mill pond	400
Fayetteville, Tilghman's pond	300
Fitzgerald, Lynwood Lake	200
Fort Gaines, Smith's ponds	400
Gibson, Gin Pond	400
Gillsville, Meaders's pond	100
Gray, Bonner's pond	50
Graymont, Weatherford's pond	800
Greensboro, Sanders Pond	300
Griffin, Connelly's pond	175
Grovetown, Blount's pond	100
Hampton, Derrick's pond	150
Hopeville, Lee's pond	175
Hawkinsville, Anderson's pond	150
Richardson's pond	150
Holly Springs, Little River	800
James, James's pond	200
La Grange, Aubrey's pond	150
Lake Park, Ashley's pond	300
Clayton Lake	400
Francis Lake	400
Jones Lake	300
Lake Alberta	400
Lake Tom	400
Lofton Lake	400
Wesenbokee Lake	400
Lawrenceville, Davis's pond	150
Lithonia, Jones's pond	100
Louisville, Weeks's pond	150
Luthersville, Upshaw's pond	150
McIntyre, Eady's mill pond	300
McRae, Creekside Pond	950
Macon, Herring's pond	400
Willingham's pond	150
Georgia—Continued.	
Marietta, Delk's pond	200
McTyre's pond	50
Maxeys, Nichols's pond	100
Mayfield, Lake View	400
Meldrim, Ogeechee River	1,000
Metter, Turner's pond	100
Montezuma, Felton's pond	175
Frederick Mill Pond	375
Lewis's pond	375
Riverside Lake	175
Monticello, Jackson Spring Pond	50
Norwich, Montgomery's pond	300
Ocilla, Poplar Spring Pond	300
Preston, Jenkins's pond	400
King Pond	375
Quitman, Bentley Lake	300
Blue Pond	300
Elam Branch Lake	400
Fernside Lake	400
Knights Lake	300
Rebecca, White's pond	200
Reynolds, Beaver Pond	400
Richland, Highnote's pond	175
Roberta, Hardies Pond	200
Harris's pond	100
Rockmart, Holly Springs Pond	100
Parris's pond	300
Roswell, Manning's pond	175
Rupert, Copper's pond	200
Savannah, Chapman's pond	200
Jones Lake	200
Scottdale, Scottdale Mills Pond	100
Screven, Little Satilla River	600
Siloam, Oliver Pond	150
Smyrna, Fambrough's pond	50
Social Circle, Gibb's pond	200
Malcom's pond	200
Soperton, Bahtail Pond	300
Henry's pond	150
Aiken Pond	400
Sparta, Lewis Pond	200
Ogeechee Lake	600
Spread, Rhodes's pond	300
Statesboro, Cannon's pond	150
Temples's pond	400
Stone Mountain, Venable Lake	300
Sunny Side, Malain Mill Pond	400
Minter's pond	400
Swainsboro, Bell's pond	300
Chalker's pond	175
Durden Pond	800
Open Creek Pond	400
Rountree Pond	50
Tarrytown, Warnock's pond	300
Thomasville, Rains Pond	300
Hall Pond	300
Woodland Pond	300
Thomson, Brier Creek	1,200
Sweetwater Pond	400
Tifton, Whitley's pond	300
Valdosta, Fenders Lake	400
Richardson Pond	400
Vidette, Robinson Pond	300
Wadley, Perkins Pond	200
Warthen, Sparks's pond	200
Washington, Pope's pond	100
West Point, Eastridge's pond	150
White Plains, Jarrell Pond	150
Tappan's pond	150
Willacoochee, Spring Pond	300
Winder, Gooch's pond	150
Wray, Rogers's pond	300
Wrens, Big Creek	600
Wrightsville, Ohoopee Creek	1,000
Illinois:	
Alexis, Sedwick's pond	200
Apple River, Apple River	500

Distribution of fish and eggs, fiscal year 1917—Continued.

SUNFISH—Continued.

Disposition.	Number.
Illinois—Continued.	
Chicago, Aquarium	25
Council Hill, Fever River	300
Crystal Lake, Crystal Lake	6,000
Dallas City, Lake Cooper	a 689
Dix, Purcell's pond	100
Elizabeth, Apple River	900
Farmer City, Salt Creek	200
Galena, Mississippi River	a 193,000
Galesburg, City Lake	200
Greenfield, Mill Pond	200
McLeansboro, Jones's pond	200
Meredosia, Meredosia Bay	a 34,800
Millington, Fox River	200
Nora, Apple River	300
North Hanover, Apple River	400
Ozark, Reynoldsburg Pond	100
Rodden, Apple River	300
Scales Mound, Fever River	200
Shelbyville, Kaskaskia River	100
Stockton, Plum River	400
Warren, Apple River	700
Waverly, Brown's pond	100
Indiana:	
Bath, De Armond Lake	200
Borden, McClutchan's pond	200
Connersville, Village Creek	400
Whitewater River, West Fork	400
Corydon, Herter's pond	300
Crawfordsville, Rock River	400
Dabney, Devaney's pond	200
Eckerty, Eckerty's pond	125
Edinburg, Sugar Creek	400
Evansville, Evansmore Pond	300
Goshen, Stone Lake	200
Greenfield, Walker's pond	200
Huntingburg, Finke's pond	250
Water Works Lake	500
La Fontaine, Gards Gravel Pond	100
La Grange, Appleman Lake	200
Cotton Lake	200
La Porte, Pine Lake	200
Liberty, Sugar Creek Pond	200
Morris, South End Pond	200
Muncie, Gravel Pit Pond	200
Nappanee, Stump's pond	100
New Point, Kleumper's pond	200
Paoli, Wells's pond	200
Plymouth, Dixon Lake	200
Pretty Lake	200
Ridgeville, Warren's pond	200
South Bend, Clear Lake	100
Iowa:	
Adelphi, Ballard's pond	150
Bellevue, Mississippi River	a 731,700
Boone, Des Moines River	600
Carroll, Judge's pond	150
Edgewood, Honey Creek	200
Fairfield, Fairfield Pond	1,000
Fryman's pond	300
Fairport, Mississippi River	a 65,694
Mississippi River	a 3,730
Lime Springs, Upper Iowa River	2,200
Manchester, Maquoketa River	2,500
North McGregor, Mississippi River	a 473,700
Underwood, Benson's pond	300
West Burlington, Railroad Pond	200
Kansas:	
Amiot, Knight's pond	100
Chanute, Alden Lake	1,000
Girard, Burnett's lake	400
Kentucky:	
Ashland, Ohio River	450
Beaver Dam, Mill Pond	200
Brandenburg, Applegate's pond	200
Bewley's pond	300
Drury's pond	100
Sebastin's pond	300
Corydon, Horse Lot Pond	250
Kentucky—Continued.	
Dixon, Jackson's pond	100
Dry Ridge, Carlsbad Lake	200
Exron, Funk's pond	100
Elkton, Sunnyside Pond	100
Ferguson, Davies's pond	100
Franklin, Beard Pond	100
Boaz Pond	100
Eldridge's pond	250
Gomer Pond	100
Hays Pond	100
McClanahan Pond	100
Neely's pond	100
Red Pond	100
Slacks Pond	100
Sloan Pond	100
Sloss Pond	100
Widener Pond	100
Georgetown, Hall's pond	200
Gilbertsville, Gregory's pond	100
Glasgow, Duff's pond	100
Greenville, Coomb's pond	100
Newman's pond	100
Guthrie, Church Hill Pond	200
Hawesville, Indian Lake	800
Hodgenville, Goodin's pond	100
La Rue's pond	100
Long Pond	300
Hopkinsville, Hays Pond	100
Kenton, Rigg's pond	150
Kuttawa, Cumberland River	a 2,831
Lakeland, Hospital Lake	2,000
Lawrenceburg, Blakemore Pond	200
Cox's pond	100
Trent's pond	200
Leitchfield, Beauchamp's pond	200
Louisville, Floyds Fork	2,100
Harrods Creek	2,100
Madisonville, Laughlin Lake	100
Morganfield, Flournoy's pond	200
Mount Sterling, Clark's pond	150
Grassy Lick Creek	450
Otter Pond, Sim's pond	100
Pembroke, Brewer's pond	100
Pulaski, Pleasant View Lake	200
Russellville, Browning's pond	100
Tillie, Collins's pond	100
Whitesburg, Polly's pond	100
Louisiana:	
Bogalusa, Pine Tree Lake	150
Lecompte, Bayou Beauf	300
New Orleans, Aquarium	40
Ponchatoula, Prince's pond	50
Maryland:	
Bladensburg, Cedar Hill Lake	100
Dickerson, Potomac River	300
Motters, Dorsey's pond	100
Royal Oak, Solitude Pond	100
Seneca, Potomac River	a 1,225
Towson, Turnbull Pond	100
Massachusetts: Plymouth, Moreys Pond	200
Michigan:	
Au Sable, McPhee Lake	200
Gwinn, Miller Lake	200
Highland, Lake in Oakland County	9,000
Houghton, Long Lake	200
Iron River, Iron River, branch of	200
Jackson, Wolf Lake	600
Kingsley, Arbutus Lake	300
Big Muncie Lake	200
Rennie Lake	200
Spider Lake	200
Marquette, Pohlman Pond	100
Sylvania, Deep Gully Creek	200
White Cloud, Allie Lake	400
Big Robinson Lake	400
Little Robinson Lake	400
Long Lake	400

a Rescued from overflowed land and returned to original waters.

Distribution of fish and eggs, fiscal year 1917—Continued.

SUNFISH—Continued.

Disposition.	Number.	Disposition.	Number.
Minnesota:		Mississippi—Continued.	
Adrian, Lander's pond	200	Cranfield, Cranfield Pond	150
Degraff, St. Marys Lake	600	Crawford, Richards's pond	150
Detroit, Wheeler Lake	450	Decatur, Spivey's pond	400
Duluth, Horseshoe Lake	620	Eupora, Sylvadale Pond	200
Elk River, Shandy Lake	600	Flora, Gary Lake	150
Faribault, Milligan Lake	400	Hillside Pond	150
Fertile, Mill Pond	300	Oakhurst Lake	150
Plathe Park Pond	200	Pleasant Valley Pond	150
Homer, Mississippi River	[a] 106,475	Rohrbocker Pond	150
Lake City, Lake Pepin	[a] 11,977	Wild Duck Pond	150
Little Falls, Fish Lake	600	Foster, Junkin's pond	150
Minneapolis, Glenwood Lake	300	Friars Point, Mississippi River	[a] 46,083
Lake Calhoun	250	Goodman, Crawford's pond	100
Pecks Lake	600	Hardy, Powell's lake	200
Morton, Schafer's pond	150	Thomason's pond	200
Owatonna, Rice Lake	600	Hattiesburg, Lovett's pond	300
Richmond, Mississippi River	[a] 40,150	Hazlehurst, Breynard Pond	150
Rochester, Rochester Mill Pond	600	Hargrave's lake	400
Sturgeon Lake, Steve Lake	450	Heidelberg, Morrison's pond	150
Winona, Lake Winona	2,200	Ratcliffe's pond	300
Mississippi River	[a] 38,030	Hernando, Dockery's pond	400
Sugar Loaf Mill Pond	500	Ingomar, Guyton's pond	150
Mississippi:		Jackson, Crescent Lake	400
Aberdeen, Black Lake	100	Kosciusko, Bailey Lake	600
Blue Lake	100	Gray's pond	200
Bream Lake	100	Sander's pond	100
Clear Lake	100	Lauderdale, Watson's pond	100
Cribs Pond	150	Little Rock, Matley's pond	150
Deer Lake	100	Lokey, Haney's pond	600
Goose Lake	100	Louisville, Foster's pond	200
Grubs Spring Pond	150	McCool, Kennedy's pond	200
Hickory Lake	150	Sander's pond	200
Honey Pond	150	Smith's pond	200
Jellow Pond	150	Macon, Cedar Brook Pond	100
Jones Lake (A)	100	Oil Mill Pond	100
Jones Lake (B)	100	Scales's pond	100
Lily Pond	150	Madison, Bennett's pond	100
McGown's pond	100	Magnolia, Lake Charles	150
Moon Lake	100	Magnolia Pond	200
Murff's pond (A)	100	Martinsville, Dunn's pond	200
Murff's pond (B)	100	Mathiston, Davis's pond	200
Murff's pond (C)	100	Meridian, Queen City Pond	200
Murff's pond (D)	100	Wanita Pond	300
Robert's pond	100	Mize, Sullivan's pond	150
Rodgers Lake	150	Montrose, James's pond	200
Sanders Pond	150	Mount Olive, Tyrone's pond	200
Silver Pond	150	Natchez, Point Plantation Ponds	150
Smith Pond	150	New Albany, Coker's pond	200
Sulphur Spring Pond	150	Phyfer's pond	200
Sunberry Lake	150	Robbin's pond	200
Walters Pond	150	New Augusta, Tucker's pond	200
Ackerman, Griffin's pond	200	Ovett, Tucker's pond	400
Shaw's pond	200	Pheba, Terry's pond	400
Amory, Dalrymple Lake	200	Philadelphia, Phillips's pond	150
Duke's pond	100	Pickens, Scott's pond	100
Lily Pond	100	Pontotoc, Dillard's pond	200
Parker Spring Pond	100	Hubbard's pond	200
Reese Lake	300	Prairie, Goode's pond	100
Wadkins Lake	300	Raymond, Gibbs Pond	150
White Lake	200	Gillespie's pond	150
Baldwyn, Tison's pond	150	North's pond	150
Batesville, Boothe's pond	200	Ratliff's pond	150
Booneville, Davis's lake	300	Sivley's pond	150
Jones Lake	300	Well's pond	150
Jones's pond	150	Rienzi, Rinehart's pond	300
Braxton, Comby Pond	400	Rome, Ferguson's pond	100
Brooksville, Cunningham's pond	100	Selma, Wilton Woods Pond	150
Canton, Layman's pond	100	Senatobia, Yeazey Pond	200
Priestley's lake	400	Shubuta, Graham's pond	100
Centreville, Melba Pond	100	Shuqualak, Adam's pond	100
Clinton, Johnson's pond	150	Starkville, Caldwell Pond	200
Collierville, Koen's pond	100	Club Lake	200
Collins, Upton's pond	200	Glenn's pond	200
Columbus, Wades Lake	300	Gunn's pond	200
Como, Craigcrest Pond	100	Hickory Grove Pond	100
Trotter's pond	100	Hill Pond	200
Corinth, Miller's pond	150	Richey's pond	200
Courtland, High School Lake	600	Steens, Spring Rill Pond	150

[a] Rescued from overflowed lands and returned to original waters.

Distribution of fish and eggs, fiscal year 1917—Continued.

SUNFISH—Continued.

Disposition.	Number.
Mississippi—Continued.	
Stringer, Brown's pond	200
Strongs, Clay's pond	100
Lone Pine Lake	100
Watson Lake	100
Sharp's pond	200
Sumrall, Hemba's pond	200
Terry, Dulaney's lake	400
Jones's pond	150
Tibbee, Lake Lena	100
Tomnolen, Hall's pond	300
Tupelo, Barnes's pond	100
Cosby's pond	100
Turnbull, Magnolia Pond	200
Union, Fair View Pond	200
Live Oak Pond	200
Wahalak, Buck Pond	100
Waynesboro, Cochran's pond	100
Davis's pond	100
Weathersby, Cypress Lake	300
West Point, Ivy's pond (A)	200
Ivy's pond (B)	200
Lawn Lake	100
Margaret Tipton Pond	100
Munger's pond	100
Pike Pond	100
Whites, Weeping Willow Lake	100
Winchester, Mill Pond	100
Howard's pond	200
Woodland, Bermuda Hill Pond	200
Argue's pond	100
College Pond	100
Harris's pond	100
Henderson's pond	100
Pecan Lake	100
Road Pond	100
South View Pond	100
Spider Lake	100
Missouri:	
Arlington, Big Piney River	1,000
Berwick, Clear Creek	3,200
Clinton, Miola Lake	600
De Soto, Murphy Lake	450
Ferguson, Wabash Club Lake	1,454
Fortesque, Bigelow Lake	1,700
Jasper, Vincent's pond	200
Joplin, Sloan's pond	200
Kansas City, Alton-Slater Pond	1,200
Friedman's pond	200
Lake of the Woods	120
La Belle, Lake Mattingly	300
Merwin, Corbin's pond	2,000
Monett, Lane's pond	600
Sunnyside Pond	150
Neosho, Morse Park Pond	1,300
Schuler's pond	150
Northview, Barnhart's pond	200
Pleasant Hill, Kellogg Lake	1,200
Lake Blanche	1,200
Rolla, North Spring Creek	800
Sedalia, Kahn's pond	200
Norton's pond	2,000
Slater, Rhoades's pond	200
Speed, Ingleside Pond	300
Valley Park, Wilson Lake	1,600
Verona, Spring River	2,500
New Jersey:	
Boonton, Towasco Lake	200
Old Bridge, Laurel Pond	250
New Mexico:	
Alamillo, San Acacia Lake	200
Chamita, Rio Grande	150
Clayton, Perico Creek	200
Deming, Idyl-Wyld Pond	100
Elida, McAlester's pond	50
Mullen's pond	50
Phillips's pond	50
Estancia, Barnhart's pond	100
Williams Lake	100
Kenna, Kimo Pond	50
New Mexico—Continued.	
Las Vegas, Sweeney Baxter Pond	200
Lucy, McGillivray's pond	100
Maxwell, Lake Twenty	400
Melrose, De Graftenried's pond	100
Sweet's pond	50
Nara Visa, Douglass's pond	100
Portales, Dunlap Lake	100
Roswell, Figure Eight Lake	50
North Berrendo River	200
South Spring River	50
San Jon, Stemple's pond	100
Santa Rita, Mimbres River	100
Socorro, Story's pond	50
Torreon Pond	50
Texico, Young's pond	100
Wagon Mound, Jordan's pond	75
Yeso, Willoughby's pond	50
North Carolina:	
Auburn, Ferrell's pond	200
Bessemer, Baldwin's pond	100
Bladenboro, Bridger's pond	400
Singletary Pond	400
Bostic, Gurley-Hollifield Pond	100
Chapel Hill, Andrews's pond	200
Charlotte, Thompson Pond	200
Clayton, McCullen's pond	200
Whiteoak Pond	600
Coats, Stewart's pond	1,000
Connelly Springs, Alexander's pond	100
Corinth, Buckhorn Falls Pond	200
Duncan, Baker's pond	200
Elizabeth City, Pasquotank River	3,200
Elkland, Moretz's pond	200
Flat Rock, Phinizy's pond	200
Franklinton, Gulley's pond	200
Willow Valley Pond	100
Greensboro, Ogburn's pond	400
Sunnyside Pond	500
Harris, Henson's pond	150
Holly Springs, Mills's pond	400
Jackson Springs, Hankins's pond	200
Kinston, Carraways's pond	300
Louisburg, Shearin's pond	125
Lumberton, Alligator Pond	400
Riverside Pond	500
McFarlan, Moore's pond	300
Manchester, Barney's pond	200
Marshville, Beaverdam Pond	150
Mayworth, Cotton Pond	300
Mebane, Corbett's pond	200
Nihols Pond	50
Mocksville, Reavis's pond	300
Monroe, Houston's pond	150
Willow Pond	200
Woods Pond	150
Morganton, Carpening Mill Pond	200
Morrisville, Sears's pond	200
Morven, Eddins's pond	200
Gatlings's pond	200
Gray Pond	200
Mount Airy, Brower's pond	400
Mount Olive, Williams's mill pond	400
Newells, Timmon's pond	100
Oakboro, Mason Branch Pond	200
Parkton, Campbell Pond	400
Pee Dee, Blewett Falls Pond	400
Raleigh, Bartholomew's pond	200
King's pond	200
Kitchin's pond	200
Milburnie Pond	300
Neuseoco Pond	200
Panther Pond	200
Roaring River, Byrd's pond	150
Rockingham, Falling Creek	300
Watery Branch Pond	200
Roseboro, Crumpler's pond	400
Sanford, Old Still Creek	100
Scotland Neck, Josey's pond	450
Severn, Blackwater Pond	175

Distribution of fish and eggs, fiscal year 1917—Continued.

SUNFISH—Continued.

Disposition.	Number.
North Carolina—Continued.	
Wadesboro, Huntley's pond	200
Wake Forest, Bailey's pond	200
Brewer's pond	200
Powell's pond	150
Rocky Branch	200
Wall's pond	200
Weldon, Club Pond	250
Williamston, Little Conoho Creek	650
Wilmington, Quarry Lake	600
Wilson, Farmers Mill Pond	500
Winston Salem, Livingood's pond	300
Woodleaf, Alexander Pond	150
Youngsville, Clifton's pond	450
Moore's pond	300
North Dakota:	
Devils Lake, Devils Lake	1,000
Lisbon, Sheyenne River	800
Ohio:	
Akron, Long Lake	450
Nesmith Lake	450
New Lake	450
Turkeyfoot Lake	300
West Lake	450
Athens, Burson's pond	200
Bellville, Gatton's pond	100
Berea, Brown's pond	300
Cambridge, City Lake	300
Tin Mill Pond	100
Canton, Foster's ponds	300
Carey, Club Pond	150
Chillicothe, Paint Creek	400
Cleves, Morgan's pond	200
Covington, Panther Creek	400
Crestline, Sandusky River	450
Creston, Evergreen Pond	150
Lima, McCullough Lake	150
Loveland, Schemel's pond	200
Mentor, Spring Pond	150
Millersburg, Rottman Park Lake	200
Newark, Buckeye Lake	600
Licking River	600
New Bavaria, Kammerer's pond	150
North Baltimore, Demming Quarry Pond	150
North Randall, Warner's pond	150
Oak Harbor, Portage River	150
Plymouth, Quarry Lake	300
St. Marys, Lake St. Marys	600
Strongsville, Deer Lick Pond	150
Wickliffe, Neale's pond	150
Oklahoma:	
Ada, Lewis's pond	200
Ardmore, Boucher's pond	100
Club Lakes	800
Armstrong, Hatchery Ponds	90
Blocker, Delorvin's pond	100
Bristow, Edgewood Pond	200
Morgan's pond	200
Byars, Lake Catron	200
Town Lake	100
Carney, Roberts's pond	200
Chickasha, Club Lake	200
Coleman, Wood Lake	100
Cordell, Bonham's pond	200
Custer City, Schneider's pond	200
Earlboro, Spinks's pond	200
Edmond, Keefer's pond	200
Erick, Everett's pond	200
Featherston, Prairie Lake	200
Forgan, Lawson's pond	100
Konawha, Cook's pond	200
Flag Lake	200
Townsend's pond	200
Maramec, Pattison Pond	200
Milburn, Rhea's pond	200
Minco, Sherer Spring Lake	200
Mounds, Barton's lake	200
Muskogee, City Park Lake	100
Noble, Lake Dunaway	200
Nowata, Tillotson's pond	200
Oklahoma—Continued.	
Oakman, Wilborn's pond	200
Oakwood, Bermuda Lake	100
Orlando, Twin Oak Pond	200
Pauls Valley, Driskill's pond	100
Thompson's lake	200
Perry, Pagel's pond	200
Perry Lake	200
Waltermire's pond	200
Rocky, Bowman's pond	200
Seminole, Quimby's pond	200
Sparks, Fairview Pond	200
Stillwater, Ahrberg's pond	200
Callison's pond	200
Parker's pond	200
Stratford, Agnew Pond	100
McAlister's pond	100
Stroud, Silver Pond	200
Texhoma, Allison's pond	200
Texola, Graves's pond	200
Walter, Eder's pond	100
Wapanucka, Darter's pond	200
Watova, Munson's pond	100
Weatherford, Cobb Creek	100
Wellston, Lyon's pond	200
McKinney Pond	200
Wynnewood, Willow Spring Pond	100
Pennsylvania:	
Butler, Conoquenessing Creek	350
Muddy Creek	350
Christiana, Octoraro Creek	600
Claysburg, Juniata River, Beaver-dam Branch	250
Curry, Keagy Pond	375
Denver, Swamp Creek	200
Eagles Mere, Eagles Mere Lake	600
Falls, Lake Winola	600
Gap, Pequea Creek	600
Lancaster, City Mill Pond	600
Isaiah Weavers Pond	600
Martin's pond	600
Mill Creek	250
Nult's pond	600
Rocky Spring Pond	600
Sensenig Pond	600
Landenburg, White Clay Creek	400
Langhorne, Neshaminy Creek	400
Lititz, Hubers Pond	70
Newtown, Neshaminy Creek	400
Philadelphia, League Island Pond	500
Phoenixville, French Creek	600
Schuylkill River	600
Pocono Summit, Tunkhannock Creek	200
Reading, Beaver Creek	231
Socany Creek	210
Rushland, Neshaminy Creek	400
Safe Harbor, Hess Run	276
Savan, Mud Lick Run	250
Scranton, Moosic Lake	600
West Willow, Pequea Creek	200
Wilkes-Barre, Thorn Lake	400
South Carolina:	
Aiken, Redcliffe Pond	600
Baldoc, Doe Pond	1,400
Bethune, Mangum's pond	200
Munn's pond	400
Blythewood, Wilson's pond	600
Central, Arnold's pond	200
Clio, Everett Mill Pond	200
Columbia, Brown's pond	600
Cobb's pond	800
Dent's pond	800
Padgett Pond	800
Reedy's pond	600
Snow Hill Pond	200
Conway, Cypress Pond	400
Creston, Holman's pond	400
Darlington, Broadmoor Pond	400
Crescent Lake	400

Distribution of fish and eggs, fiscal year 1917—Continued.

SUNFISH—Continued.

Disposition.	Number.
South Carolina—Continued.	
Dalzell, Haynsworth Pond	400
Denmark, Lake Lorraine	600
Easley, Adkin's pond	400
Alice Mills Ponds	400
Glenwood Lakes	400
Hendrix's pond	200
Edgefield, May's pond	200
Gaffney, Hamrick's pond	200
Wood's pond	200
Gaston, Giugnard's pond	600
Greelyville, Lesesue's pond	400
Greenville, Harris's pond	200
Hunts Pond	400
Kelly's pond	200
Mill Pond	400
Reedy River	400
Greenwood, Panola Pond	200
Hampton, Rentz's pond	400
Hodges, Gantt's pond	200
Johnston, Edisto Pond	2,000
Nancy Lake	2,000
Yonce's pond	1,500
Langley, Clearwater Power House Pond	800
Leesville, Clearwater Pond	200
Summerland Farm Pond	200
Lexington, Roof's pond	200
Liberty, Gantt's pond	200
Lykesland, Rawlinson's pond	300
McBee, Cedar Creek Pond	400
Hannah Pond	400
Middleton's pond	400
Marion, Little Pee Dee River	800
Minturn, McQueen's pond	400
Mount Croghan, Wilson's pond	200
Neeses, Bolin's pond	500
Fogle's pond	500
Newberry, Johnston's pond	200
Smith's pond	200
North, Salem Pond	1,000
Orangeburg, Caw Caw Creek	1,000
Caw Caw Pond	300
Dukes's pond	300
Fishery Branch	1,500
Jennings's pond	600
Salley's pond	500
Pelion, Lucas's pond	400
Pomaria, Bedenbaugh's pond	200
Richburg, Fishing Creek	600
Richland, Verner's pond	200
St. Matthews, Millwood Pond	400
Salley, Haltiowanger's pond	1,200
Seneca, Langston's pond	200
Maple Pond	200
Simpsonville, Garrett's pond	200
Richardson's pond	200
Society Hill, Evans Mill Pond	400
Spartanburg, Chapman's pond	400
Poole's pond	400
Sumter, Pocalla Lake	600
Privateer Pond	400
Whilden's pond	800
Summerville, Schultz Lake	400
Taylors, Bridwell's pond	200
Trenton, Crouch's pond	800
Miller's pond	1,200
White Oak, Adger Pond	200
Winnsboro, Moore's pond	200
Williford Lakes	200
South Dakota:	
Belvidere, Belvidere Lake	800
Canton, Sioux River	300
Clear Lake, Clear Lake	600
Lake Andes, Lake Andes	1,400
Lemmon, Haltzel's pond	200
Madison, Lake Madison	1,400
Pukwana, Red Lake	1,400
Timber Lake, Simonson's pond	200
Tennessee:	
Bolivar, Hazlegrove's pond	50
Brace, Buffalo Pond	150
Brownsville, Cobb's pond	80
Collinswood, Cole's pond	150
Harriman, Browder's pond	200
Heiskell, Gadson's pond	100
Jacksboro, Queener's pond	200
McMinnville, Mountain Creek	80
Maryville, Tucker Pond	235
Memphis, Arnold's lake	240
Mont Eagle, Gregory's pond	100
Quebeck, Chaneller's pond	200
White, Walnut Grove Pond	50
Texas:	
Abernathy, Henderson Pond	100
Athens, Deupree's pond	150
Atlanta, Baucum's pond	200
Cameron's pond	200
Chamblee's pond	200
Henry's pond	200
Long Pond	200
White's pond	200
Baird, Highland Lake	100
Tatum's pond	100
Terrell's pond	100
Belton, Leon River	300
Boerne, Menger Creek Pond	300
Bonham, Johns Estell Repose Lake	50
Stager's pond	50
Brady, Bengstrom's pond	100
Henderson's pond	100
Wooten's pond	100
Brownwood, Arczie's pond	250
Burleson, Overton's pond	200
Burton, Fusch's pond	150
Caldwell, Haddox's pond	150
Chapel Hill, Caney Creek	400
Christine, Barber's pond	200
Barker's ponds	300
Clarksville, Sherry Pond	650
Coleman, Crockett's pond	250
Cooper, Lake Geneva	150
Crockett, Berry's lake	200
Smith's lake	200
Crosbyton, Miller's pond	100
Dallas, Country Club Lake	400
Edgewood, Jones's pond	100
Elgin, Johnson's pond	200
Elkhart, Howell Lake	150
Enloe, Petitfil's pond	100
Fredericksburg, Kneese's pond	100
Giddings, Berger's pond	200
Fischer's pond	200
Gilmer, Blue Lake	250
Carey Lake	250
Mattox Pond	100
Phillips Lake	250
Silver Lake	300
Warren's pond	250
Graford, Humphre-Halsel Pond	100
Grand Saline, Clarke's pond	100
Crawford's lake	150
Germany Lake	150
Harper Lake	150
Grapeland, Gaines's pond	150
Harrisburg, Plum Creek	300
Henderson, Bennett's pond	200
Strong's pond	200
Hubbard, Waterworks Lake	250
Jacksboro, Gaskin's pond	100
Graves's pond	100
Jacksonville, Goodson's lake	300
Hogan's lake	400
Park Lake	600
Kilgore, Nolen's pond	100
Littlefield, McCelvey-Ely Pond	100
Longview, Clear Lake	400
T. & P. Lake	300

Distribution of fish and eggs, fiscal year 1917—Continued.

SUNFISH—Continued.

Disposition.	Number.
Texas—Continued.	
Lubbock, Fair Acres Pond	200
Loyd's pond	100
Potts's pond	100
Barber's pond	300
Scroggin's pond	100
Lyons, Ruback's pond	100
Manor, Eppright's pond	200
Marfa, San Jacinto Pond	150
Webb Pond	150
Marshall, Martin's lake	300
Woodland Lake	200
Midland, Cloverdale Pond	100
Mineola, Beaupre's pond	150
Blue Lake	200
Clanton Pond	300
Concord Pond	100
Conger's pond	200
Huff Lake	300
Mineral Wells, Turkey Creek	250
Monahans, Bullock Pond	100
Jones Pond	100
Ranch Pond	100
Woods Pond	100
Mount Calm, Davis's pond	150
Muleshoe, Bledsoe's pond	100
Novice, Clear Pond	200
Paige, Koslan's pond	150
Palestine, Broughton's lake	300
Crystal Lake	700
Sand Lake	200
Spring Park Lake	250
Pearsall, Elm Pen Pond	100
Indian Hill Pond	100
Maney's pond	100
Plainview, Saigheig's pond	150
Ravenna, Cunningham's pond	195
Grogan's pond	165
Rockdale, Blue Pond	200
Praesel's pond	200
Rugby, Griffin Lake	250
Spofford, Jone's pond	100
Tahoka, Wood's pond	100
Taylor, Burkmann's pond	200
Inland Lake	150
Temple, Lily Pond	100
Terrell, Bond's pond	300
Tyler, Chinquapin Lake	300
Hitts Mill Pond	300
Welfare, Joshua Creek	200
Winchell, Duncan's pond	162
Virginia:	
Beaver Dam, Sunny Pond	100
Benhams, Sproles's pond	100
Charlottesville, Lyons Pond	20
Colburn, Silver Lake	100
Drakes Branch, Dalton's pond	20
East Lexington, North River	500
Virginia—Continued.	
Evergreen, Glover's pond	20
Ferrum, Brogan's pond	100
Fort Mitchell, Watson's pond	20
Lawyers, Flat Creek	20
Lynchburg, McGehee's pond	100
McKinney, Long Pond	100
Pamplin, Driskill's pond	20
Richmond, City Lakes	20
Lakeside Lake	40
Spout Springs, Robertson's pond	20
Suffolk, Brewer's pond	300
Lake George	300
Sycamore, Owen-Hunt Pond	100
Plains, Goose Creek	80
Huntland Pond	40
Ice Pond	100
Waverly, Clark Mill Pond	400
West Virginia:	
Coleman, Thompson's pond	200
White Sulphur Springs, Howard Creek	100
Wisconsin:	
Alma, Waumandee Mill Pond	600
Beaver Dam, Beaverdam Lake	1,100
Blair, Trempealeau Pond	1,000
Deer Park, South Fish Lake	400
Eland, Lake Go-To-It	1,000
Fountain City, Mississippi River	[a] 84,445
Frederic, Diamond Lake	600
Genoa, Mississippi River	[a] 75,000
La Crosse, Bank Slough Creek	1,000
Browns Marsh Lake	1,000
Coleman Slough Creek	1,000
Crooked Slough Creek	1,000
French Lake	1,000
Holman Mill Pond	1,000
Maxs Lake	1,000
Mississippi River	[a] 175,000
Round Lake	1,000
Twin Lakes	1,000
West Salem Mill Pond	1,000
La Farge, Kickapoo River	1,000
La Farge Mill Pond	750
Rockton Mill Pond	750
Lynxville, Mississippi River	[a] 20,000
Prairie du Sac, Berges Lake	800
Kruger Pond	500
Lodi Creek	500
Swanson Lake	800
Stanley, Eau Claire River, North Fork	400
Trempealeau, Mississippi River	[a] 158,125
West Prairie Mill Pond	1,000
Viroqua, Mapledale Pond	1,400
Wyocena, Tiger Mill Pond	400
Canal Zone: Ancon, Panama Canal	800
Total [b]	2,670,513

PIKE PERCH.

Arkansas: Black Rock, Black River	83
Illinois:	
Carlinville, Macoupin Creek	†200,000
Dallas City, Lake Cooper	11
Kankakee, Kankakee River	†250,000
Meredosia, Meredosia Bay	†50,000
Napierville, Du Page River, West Branch	†250,000
Spring Grove, State fish commission	*15,000,000
Wilmington, Kankakee River	†250,000
Indiana:	
Culver, Lake Maxinkuckee	†300,000
Edinburg, Sugar Creek	†300,000
Indianapolis, State fish commission	*17,000,000
Indiana—Continued.	
Logansport, Fletcher Lake	†200,000
Pleasant Lake, Pleasant Lake	†200,000
Warsaw, Tippecanoe Lake	†500,000
Iowa:	
Fairport, Mississippi River	606
Spirit Lake, State fish commission	*40,000,000
Kentucky:	
Altro, Kentucky River, North Fork	†100,000
Athol, Kentucky River, Middle Fork	†200,000
Bowling Green, Barren River	†1,300,000
Chavies, Kentucky River, North Fork	†100,000
Cornettsville, Kentucky River, North Fork	†300,000

[a] Rescued from overflowed lands and returned to original waters.
[b] Lost in transit, 8,400 fingerlings.

Distribution of fish and eggs, fiscal year 1917—Continued.

PIKE PERCH—Continued.

Disposition.	Number.
Kentucky—Continued.	
Glomawr, Kentucky River, North Fork	†200,000
Haddix, Kentucky River, North Fork	†100,000
Hazzard, Kentucky River, North Fork	†100,000
Jackson, Kentucky River, North Fork	†100,000
Johnsonville, Kentucky River, Middle Fork	†300,000
Livingston, Rockcastle River	†500,000
Louisville, Ohio River	†2,000,000
Mount Vernon, Renfroy Creek	†400,000
O. & K. Junction, Kentucky River, North Fork	†300,000
Peoples, Rockcastle River	†400,000
Viper, Kentucky River, North Fork	†100,000
Ward, Big Sandy River	†400,000
Whick, Kentucky River, North Fork	†200,000
Wolf Coal, Kentucky River, North Fork	†200,000
Yerkes, Kentucky River, North Fork	†100,000
Maine: Orono, Pushaw Lake	†500,000
Michigan:	
Alpena, Long Lake	†750,000
Thunder Bay River	†400,000
Bay City, Saginaw Bay	†2,400,000
Belle Isle Park, Detroit River	†400,000
Bergland, Lake Gogebic	†112,500
Channing, Sawyer Lake	†75,000
Cheboygan, Lake Huron	†2,400,000
Clare, Stephenson Lake	†250,000
Crystal Falls, Dollar Lake	†37,500
Fortune Lake	†37,500
Michigamme River, Lower	†75,000
Paint River	†225,000
Detroit, State fish commission	*40,500,000
Escanaba, Lake Florence	†37,500
Guinn, Johnson Lake	†37,500
Shag Lake	†37,500
Highland, Dunman Lake	†500,000
Whalen Lake	†400,000
Iron Mountain, Browning Lake	†37,500
Iron River, Lake No. 9	†37,500
Lake No. 16	†37,500
Michigamme River, Middle Fork	†75,000
Stanley Lake	†75,000
Sunset Lake	†37,500
Twenty Eight Lake	†37,500
Little Lake, Godin Lake	†112,500
Mandan, Lake Baily	†37,500
Mandora Lake	†37,500
Schlautters Lake	†37,500
Marquette, Pellisur Lake	†75,000
Strawberry Lake	†75,000
Michigamme, Perch Lake	†37,500
Phoenix, Gratiot Lake	†75,000
Pickford, Monoskong Bay	†2,000,000
St. Marys Junction, Franklin Pond	†37,500
South Range, Otter Lake	†112 500
Twin Lakes, Johnson Lake	†37,500
Wellington, Kallander Pond	†37,500
Witbeck, Bullhead Lake	†225,000
Wooster, Crystal Lake	†250,000
Minnesota:	
Atwater, Summit Lake	†200,000
Barnum, Big Lake	†75,000
Central Lakes, August Lake	†50,000
Homer, Mississippi River	*a* 1,825
Lake City, Lake Pepin	*a* 59
Switch 406, Pike Lake	†112,500
Waseca, Clear Lake	†200,000
Missouri:	
Newburg, Lower Piney Creek	†200,000
Wappapello St. Francis River	†250,000
Nebraska: Gretna, State fish commission	*9,800,000
New York:	
Cape Vincent, St. Lawrence River	†500,000
State fish commission	†6,600,000
Evans Mills, Indian River	†450,000
Hamilton, Leland Pond	†300,000
Madison Lake	†150,000
Newark, Coffey Lake	†400,000
Niagara Falls, Niagara River, Lower	†600,000
Potsdam, Racket River	†600,000
Schnevus, Schnevus Lake	†225,000
Shohola, Montgomery Lake	†200,000
Washington Lake	†200,000
Wurtsboro, Masters Lake	†150,000
North Dakota:	
Devils Lake, Devils Lake	*3,000,000
St. John, State fish commission	*3,000,000
Ohio:	
Antwerp, Maumee River	†300,000
Catawba Island, Lake Erie	†10,000,000
Cecil, Maumee River	†200,000
Columbus, Scioto River	†300,000
Defiance, Maumee River	†200,000
Isle St. George, Lake Erie	†20,000,000
Kelleys Island, Lake Erie	†10,000,000
Lake View, Indian Lake	†500,000
Middle Bass, Lake Erie	†26,000,000
Napoleon, Maumee River	†300,000
Oakwood, Auglaize River	†300,000
Port Clinton, Lake Erie	†15,000,000
Put in Bay, Lake Erie	†30,000,000
State fish commission	*73,600,000
Pennsylvania:	
Bryn Mawr, Earle Lake	†100,000
Clarks Summit, Chinchilla Pond	†100,000
Ford Lake	†100,000
Gravel Pond	†100,000
Mill Pond	†100,000
Erie, State fish commission	*2,000,000
Franklin, Allegheny River	†400,000
French Creek	†300,000
Sugar Creek	†200,000
Hosensack, Hosensack Creek	†150,000
Johnstown, Dubstalts Dam	†100,000
Hinckston Pond	†100,000
Quemahoning Pond	†100,000
Stony Creek	†100,000
Lancaster, Enos Weaver Pond	†40,000
Hinkletown Pond	†40,000
Hirst Pond	†40,000
Hoover Pond	†40,000
Zooks Pond	†40,000
Lebanon, Greenville Pond	†83,334
Stoever Mill Pond	†83,333
Weidman Pond	†83,333
Milford, Mud Pond	†100,000
Pleasant Mount, State fish commission	*2,000,000
Torresdale, State fish commission	*2,000,000
Union City, State fish commission	*2,000,000
Rhode Island: Providence, Wallum Lake	†400,000
South Dakota: Watertown, State fish commission	*3,000,000
Tennessee: Sevierville, Little Pigeon River	†400,000
Vermont:	
Brandon, Burr Pond	†100,000
Hinkum Pond	†100,000
Lake Hortonia	†300,000
Brattleboro, Lake Raponda	†200,000
Newbury, Harriman Pond	†100,000
North Ferrisburg, Cedar Lake	†100,000
Swanton, Missisquoi River	†9,800,000
Wells River, Halls Pond	†200,000
West Virginia:	
Charleston, Kanawha River	†500,000
Huntington, Ohio River	†500,000

a Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1917—Continued.

PIKE PERCH—Continued.

Disposition.	Number.	Disposition.	Number.
Wisconsin:		Wisconsin—Continued.	
Amberg, Glen Lake	†75,000	Menomonie, Cut Off Lake	†50,000
Bangor, La Crosse River	†200,000	Dunnville Lake	†50,000
Beaver Dam, Crystal Lake	†200,000	Downsville Lake	†50,000
Boyd, Eau Claire River	†250,000	Hunts Lake	†50,000
Otter Creek	†150,000	Manley Bend Lake	†50,000
Pike Lake	†150,000	New Haven Lake	†50,000
Cedarburg, Milwaukee River	†150,000	Red Cedar River	†100,000
Centuria, Popular Lake	†187,500	Sand Lake	†50,000
Chippewa Falls, Long Lake	†400,000	Yellow Banks Lake	†50,000
Yellow River	†300,000	Mercer, Sugar Camp Lake	†75,000
Crandon, Big Sand Lake	†37,500	Nashville, Rice Lake	†75,000
Clear Lake	†37,500	New Richmond, Cedar Lake	†200,000
Metonga Lake	†22,500	Pelican, Pelican Lake	†75,000
Sand Lake	†37,500	Pembine, Headquarters Lake	†75,000
Stone Lake	†37,500	Readstown, Kickapoo River	†250,000
Devils Lake, Devils Lake	†200,000	Kickapoo River, East Branch	†150,000
Eldorado, Eldorado Pond	†150,000	Reedsburg, Baraboo River	†200,000
Woolen Mill Creek	†150,000	Russell Creek	†150,000
Fountain City, Mississippi River	[a]790	Rice Lake, Ginder Lake	†50,000
Genoa, Mississippi River	[a]4,000	Hemlock Lake	†75,000
Gordon, Bond Lake	†75,000	Rice Lake	†100,000
Grand Rapids, Fourteen Mile Creek	†150,000	Upper Deety Lake	†50,000
Wisconsin River	†200,000	Upper Rice Lake	†50,000
Hawthorne, Lyman Lake	†100,000	Sheboygan Falls, Gerber Lake	†150,000
Hayward, Elmer Lake	†75,000	Prairie Lake	†150,000
Hagan Lake	†75,000	Stanley, Jump River	†250,000
Holly Lake	†75,000	Stone Lake, Bass Lake	†50,000
Murphy Lake	†75,000	Flat Lake	†75,000
Star Lake	†75,000	Slim Lake	†100,000
Independence, Bugle Lake	†175,000	Superior, Amnicon Lake	†100,000
Iron River, Upper Eau Claire Lake	†100,000	Tomahawk, Big Rice Lake	†50,000
Kilbourn, Wisconsin River	†200,000	Big Rice River	†100,000
La Crosse, Bank Creek	†50,000	Clear Lake	†200,000
Black River	†100,000	Crystal Lake	†200,000
Black Snake Creek	†50,000	Deer Lake	†50,000
Broken Gun Creek	†50,000	Lake Clara	†50,000
Browns Marsh Bay	†50,000	Little Rice River	†100,000
Chamberlain Creek	†50,000	Long Lake	†100,000
Clark Lake	†50,000	Manson Lake	†100,000
Dark Creek	†50,000	Muscallonge Lake	†50,000
Dodge Chute Creek	†50,000	Mystic Lake	†50,000
Dutch Creek	†50,000	Road Lake	†50,000
French Creek	†50,000	Skanawan Lake	†50,000
Hammond Chute Creek	†50,000	Somo Lake	†100,000
Jollivette Bay	†50,000	Somo River	†150,000
Mississippi River	[a]3,500	Spirit Lake	†100,000
Rice Lake	†50,000	Spirit River	†100,000
Running Creek	†50,000	Tomahawk River	†300,000
Spring Creek	†50,000	Wisconsin River	†100,000
Swift Creek	†50,000	Waupaca, Clear Lake	†175,000
Wigwam Creek	†50,000	Stratton Lake	†150,000
Lakeside, Pewaukee Lake	†250,000	Winter, Barber Creek	†50,000
Laona, Buck Lake	†75,000	Barber Lake	†100,000
Silver Lake	†75,000	Barker Lake	†50,000
Lynxville, Mississippi River	[a]5,000	Black Dan Lake	†50,000
Mellen, Carroll Lake	†50,000	Brunette River	†175,000
Lake Galilee	†75,000	Fly Bow Creek	†75,000
Menomonie, Asylum Bend Lake	†50,000	Island Lake	†75,000
Atlasta Lake	†50,000		
Bear Lake	†50,000		*212,900,000
Black Lake	†50,000	Total [b]	†174,097,500
Chippewa River	†100,000		15,874
Colfax Lake	†50,000		

YELLOW PERCH.

Colorado:		Illinois—Continued.	
Wray, McGee's pond	300	Galena, Mississippi River	[a]3,700
Matheny Lake	300	Galesburg, City Lake	30
Connecticut:		Millington, Fox River	30
Hartford, Buckland's pond	†150,000	Nora, Apple River	50
Waterbury, Pritchard Pond	300	Red Bud, Parrott Pond	75
Illinois:		Warren, Apple River	200
Dallas City, Lake Cooper	47	Indiana: Columbus, White River,	
Farmer City, Salt Creek	30	East Branch	60

[a] Rescued from overflowed lands and restored to original waters.
[b] Loss in transit, 415,000 fry.

Distribution of fish and eggs, fiscal year 1917—Continued.

YELLOW PERCH—Continued.

Disposition.	Number.
Iowa:	
Bellevue, Mississippi River	[a] 825
Fairfield, Fairfield Pond	300
Fairport, Mississippi River	[a] 305
Lime Springs, Upper Iowa River	450
Manchester, Maquoketa River	500
North McGregor, Mississippi River	[a] 10,500
Kansas: Fort Scott, Bridal Veil Lake	†20,000
Kentucky:	
Louisville, Lansdowne Lake	30
Maceo, Kingfisher Lake	120
Mount Sterling, Lewis Pond	30
Marshall's pond	30
Thompson's pond	30
Tipton's pond	30
Maryland:	
Accokeek Creek, Potomac River	†21,050,000
Broad Creek, Potomac River	†5,220,000
Pamunkey Creek, Potomac River	†4,850,000
Piscataway Creek, Potomac River	†26,180,000
Seneca, Potomac River	[a] 1,385
Swan Creek, Potomac River	†4,350,000
Massachusetts:	
Lee, Greenwater Pond	†300,000
Laurel Lake	†300,000
Lower Goose Pond	†300,000
Shaw Pond	†750,000
Stockbridge Pond	†300,000
Lowell, Keys Pond	†300,000
Long Pond	†300,000
Mud Pond	†300,000
Round Pond	†300,000
Pittsfield, Richmond Pond	†450,000
Michigan: Rose Center, Long Lake	90
Minnesota:	
Fairmont, Sisseton Lake	400
Homer, Mississippi River	†[a] 150,000 [a] 4,485
Lake City, Lake Pepin	[a] 4,970
Richmond, Mississippi River	[a] 7,350
Winona, Mississippi River	[a] 2,450
Mississippi:	
Aberdeen, Big Clear Creek	25
Bream Lake	25
Cipsy Creek	25
Dahl's pond	25
Jones's lake	25
Jones's pond	25
Park Lake	25
Smith Lake (A)	25
Smith Lake (B)	25
West Creek	25
Willow Lake	25
Moon, Moon Lake	100
Missouri:	
Ferguson, Wabash Club Lake	20
Joplin, Sloan Lake	†5,000 41
Spring River	†15,000
Kansas City, Alton-Slater Pond	273
Lisle, Lisle Lake	†20,000
Merwin, Corbin's pond	200
Neosho, Haggard Pond	†1,000
Morse Park Pond	400
Sedalia, Kahn's pond	200
New Hampshire:	
Concord, Contoocook River	†600,000
Greenfield, Otter Lake	†450,000
Sunset Lake	†450,000
Hanover, Cummings Pond	†300,000
Manchester, Long Pond	†450,000
Mosquito Pond	†450,000
New Jersey: Princeton, Carnegie Lake	180
New York:	
Barryville, Little Lake	†600,000
Cape Vincent, St. Lawrence River	†5,075,000
Carleton Island, St. Lawrence River	50,000
Fishkill, Brinckerhoff Pond	†1,050,000
Grassy Bay, St. Lawrence River	†15,775,000
Jamesport, Fleury's pond	†150,000
New York—Continued.	
Mount Marion, Birch Pond	†150,000
Narrowsburg, Lake Narrowsburg	†600,000
Ogdensburg, State fish commission	†250,000
Pine Bush, Dwaarkill Creek	†300,000
Poplar Tree Bay, St. Lawrence River	†4,400,000
Port Henry, Ledge Lake	†800,000
Rhinecliffe, Crystal Lake	†450,000
Ellerslie Lake	†600,000
Scotch Brook, St. Lawrence River	†750,000
North Carolina:	
Connelly Springs, Cannon Creek	54
Macon, Hardy Spring Pond	27
Pee Dee, Blewett Falls Lake	81
Rockingham, Pee Dee Pond	81
Wilson, Hinnant's pond	54
North Dakota: Devils Lake, Devils Lake	500
Ohio: Russells Point, Indian Lake	140
Oklahoma:	
Armstrong, Hatchery Ponds	†125,000 60
Glencoe, Murphy Lake	100
Mehan, Birdseye Lake	100
Williams's pond	100
Meridian, Brooks's pond	100
Norman, Day Lake	100
Huls Lake	100
Moody Lake	100
Shives Lake	200
State Hospital Lake	100
Steen Lake	100
Ralston, Thompson's pond	100
Rock Island, Robinson Pond	†15,000
Stillwater, Kernke's pond	100
Parks's pond (A)	100
Parks's pond (B)	100
Pennsylvania:	
Altoona, Juniata River	120
Curry, Keagy Pond	100
Haleeka, Cresson Pond	20
Philadelphia, League Island Pond	125
Quakertown, Lu Lu Park Pond	60
Vermont:	
Brandon, Lake Hortonia	†900,000
Brattleboro, West River	†600,000
East Fairfield, Metcalf Pond	†300,000
Ely, Lake Fairlee	†600,000
Fair Haven, Little Pond	225
Milton, Westford Pond	†200,000
North Ferrisburg, Cedar Lake	†400,000
Lewis Creek	†300,000
Little Otter Creek	†300,000
Poultney, Lake St. Catherine	406
Rutland, Meadow Lake	†600,000
Otter Creek	200
St. Johnsbury, Gilman's Pond	†750,000
Salisbury, Otter Creek	†500,000
Sharon, Moose Meadow Pond	†300,000
South Londonderry, Lowell Lake	†750,000
Vernon, Lilly Pond	225
Wells River, Hall's pond	†450,000
West Danville, Joes Pond	†600,000
Virginia:	
Dogue Creek, Potomac River	†26,350,000
Little Hunting Creek, Potomac River	†15,460,000
Pohick Creek, Potomac River	†26,910,000
Wisconsin:	
Brokaw, Wisconsin River	1,050
Fountain City, Mississippi River	14,800
Galesville, Lake Marmuka	600
Genoa, Mississippi River	10,000
La Crosse, Mississippi River	20,000
Lynxville, Mississippi River	3,000
Trempealeau, Mississippi River	19,320
Total	†175,421,000 163,839

[a] Rescued from overflowed lands and restored to original waters.

Distribution of fish and eggs, fiscal year 1917—Continued.

WHITE PERCH.

Disposition.	Number.
North Carolina: Edenton, Albemarle Sound	†32,625,000

WHITE BASS. [a]

Disposition.	Number.	Disposition	Number.
Iowa:		Wisconsin:	
Bellevue, Mississippi River	4,500	Genoa, Mississippi River	300
Fairport, Mississippi River	498	La Crosse, Mississippi River	10,000
		Total	15,298

YELLOW BASS. [a]

Disposition.	Number.
Missouri: Ferguson, Wabash Club Lake	15

STRIPED BASS.

North Carolina: Weldon, Roanoke River	†16,137,000

MACKEREL.

Disposition.	Number.	Disposition.	Number.
Massachusetts:		Massachusetts—Continued.	
Falmouth, Buzzards Bay	†789,000	Manchester, Massachusetts Bay	†420,000
Gloucester, Atlantic Ocean	†75,000		
Gosnold, Vineyard Sound	†1,057,000	Total	†2,341,000

BUTTERFISH.

Disposition.	Number.
Massachusetts: Gloucester, Atlantic Ocean	†920,000

COD.

Disposition.	Number.	Disposition.	Number.
Massachusetts:		Massachusetts—Continued.	
Beverly, Massachusetts Bay	†7,870,000	New Bedford, Buzzards Bay	†4,421,000
Chilmark, Vineyard Sound	†4,522,000	Rockport, Atlantic Ocean	†17,220,000
Falmouth, Buzzards Bay	†11,544,000	Tisbury, Nantucket Sound	†6,683,000
Eel Pond	†5,502,000	Vineyard Sound	†4,297,000
Great Harbor	†14,245,000	Woods Hole, Great Harbor	2,648
Nantucket Sound	†1,233,000	New York: New York City, Aquarium	*1,000,000
Vineyard Sound	†17,495,000		
Gloucester, Atlantic Ocean	†25,390,000		
Gosnold, Buzzards Bay	†2,458,000	Total	*1,000,000 †236,786,000 2,648
Great Harbor	†1,678,000		
Vineyard Sound	†96,098,000		
Manchester, Massachusetts Bay	†16,130,000		

[a] Rescued from overflowed land and restored to original waters.

Distribution of fish and eggs, fiscal year 1917—Continued.

POLLOCK.

Disposition.	Number.
Maine: Boothbay Harbor, Boothbay Harbor	†3,346,000
Massachusetts:	
Beverly, Massachusetts Bay	†189,470,000
Gloucester, Atlantic Ocean	†712,650,000
Ipswich Bay	†29,230,000
Massachusetts Bay	†13,160,000
Massachusetts—Continued.	
Manchester, Massachusetts Bay	†140,010,000
Marblehead, Massachusetts Bay	†14,620,000
Rockport, Atlantic Ocean	†292,150,000
Ipswich Bay	†79,460,000
Total	†1,474,096,000

HADDOCK.

Disposition.	Number.
Massachusetts:	
Beverly, Massachusetts Bay	†800,000
Gloucester, Atlantic Ocean	†4,920,000
Massachusetts—Continued.	
Rockport, Ipswich Bay	†1,000,000
Total	†6,720,000

FLOUNDER.

Disposition.	Number.
Maine:	
Boothbay Harbor, Boothbay Harbor	†143,342,000
Linekins Bay	†662,230,000
East Boothbay, Linekins Bay	†77,257,000
Southport, Townsend Gut	†83,437,000
Massachusetts:	
Chilmark, Menemsha Pond	†16,576,000
Falmouth, Deacons Pond Harbor	†78,126,000
Eel Pond	†14,093,000
Great Harbor	†16,907,000
Nantucket Sound	†24,246,000
Waquoiy Bay	†100,237,000
Gloucester, Annisquam River	†21,830,000
Atlantic Ocean	†44,210,000
Gloucester, Gloucester Harbor	†62,860,000
Massachusetts—Continued.	
Gloucester, Ipswich Bay	†12,280,000
Gosnold, Buzzards Bay	†16,794,000
Hadley Harbor	†111,148,000
Lackeys Bay	†31,130,000
Vineyard Sound	†133,920,000
Manchester, Manchester Harbor	†14,180,000
Massachusetts Bay	†14,300,000
Provincetown, Provincetown Harbor	†16,661,000
Wareham, Wareham River	†33,451,000
Rhode Island: Wickford, Wickford Harbor	†85,481,000
Total	†1,814,696,000

MISCELLANEOUS FISHES.[a]

Disposition.	Number.
Arkansas: Black rock, Black River	1,922
Illinois: Dallas City, Lake Cooper	398
Iowa: Fairport, Mississippi River	3,557
Kentucky: Kuttawa, Cumberland River	1,041
Minnesota: Lake City, Lake Pepin	9,027
Total	15,945

LOBSTER.

Disposition.	Number.
Maine:	
Bass Harbor, Bass Harbor	†1,000,000
Biddeford Pool, Biddeford Cove	†2,800,000
Bois Rubert, Pigeon Hill Bay	†1,500,000
Boothbay Harbor, Boothbay Harbor	†500,000
Linekins Bay	†5,000,000
Cape Porpoise, Cape Porpoise	†3,000,000
Cape Split, Cape Split Harbor	†3,500,000
Pleasant Bay	†1,000,000
Cundy Harbor, Cundy Harbor	†3,500,000
Cushing, Georges River	†2,000,000
Pleasant Point Gut	†500,000
Eastport, Broad Cove	†3,000,000
Edgecomb, The Eddy	†5,000,000
Friendship, Friendship Harbor	†1,500,000
Gouldsborough, Prospect Harbor	†2,000,000
Horse Isle, Horse Isle Harbor	†3,000,000
Jonesport, Moosecapeak Reach	†4,000,000
Kennebunkport, Kennebunkport Harbor	†3,000,000
Kittery, Pepperell Cove	†2,800,000
Machias, Starboard Creek	†3,000,000
Mare Point, Mare Point Bay	†500,000
Mount Desert, Southwest Harbor	†1,000,000
New Harbor, New Harbor	†500,000
Maine—Continued.	
North Haven, North Haven Harbor	†1,500,000
Orrs Isle, Chandlers Bay	†7,000,000
Perkins, Oquinquit Harbor	†2,800,000
Phippsburg, Small Point Harbor	†3,000,000
Port Clyde, Port Clyde Harbor	†2,000,000
Portland, Peaks Island Roads	†3,000,000
Portland Harbor	†500,000
Rockland, Rockland Harbor	†6,000,000
Rogue Bluff, Rogue Harbor	†3,000,000
South Hancock, Penobscot Bay	†4,000,000
Skillings River	†6,000,000
Southport, Ebencook Harbor	†5,000,000
Vinal Harbor, Crockett River	†2,000,000
Westport, Clarks Cove	†5,000,000
York Harbor, York River	†2,800,000
Massachusetts:	
Gloucester, Massachusetts Bay	†105,000
Manchester, Massachusetts Bay	†155,000
New Hampshire: Little Harbor, Little Harbor	†2,800,000
Washington: Anacortes, Rosario Harbor	5,400
Total	†110,260,000 5,400

[a] All enumerations listed in this statement represent miscellaneous fishes rescued from overflowed lands and restored to original waters.

DISTRIBUTION COSTS.

In the latter part of 1915 a system was inaugurated by the superintendent of car and messenger service for determining the costs of distributing the various species of fishes. To furnish the office with the desired data, "cost slips" were attached to mileage reports, which messengers were required to submit to the office upon completion of each trip. The following table, based upon information contained in cost slips, shows the average cost per 1,000 of distributing fry, fingerling, and adult fishes for the calendar year 1916, exclusive of messengers' salaries:

METHOD OF DISTRIBUTION, BY STATIONS, SPECIES, NUMBER, AND SIZE OF FISH, AND COSTS.

DISTRIBUTION BY CAR MESSENGERS.[a]

Name of station.	Species.	Number of fish.	Size.	Total cost.	Average cost per thousand.	Miles paid.	Miles free.
Bozeman, Mont.	Trout	586,000	Fry	$187.80	$0.32	1,806	
Do	do	132,600	Fingerlings, 1-inch	158.84	1.197	5,596	830
Do	do	37,100	Fingerlings, 2½-inch	174.15	4.69	2,013	
Craig Brook, Me.	do	158,000	Fry	41.45	.262	1,008	
Do	Salmon	30,000	do	17.50	.583	43	
Green Lake, Me.	do	135,000	do	36.00	.266	616	
Do	do	63,000	Fingerlings, 1-inch	66.33	1.052	1,210	
Do	Trout	60,800	Fry	21.40	.351	431	
Do	do	50,000	Fingerlings, 1-inch	16.23	.325	334	
Leadville, Colo.	do	1,616,746	Fingerlings, 1-3 inch	548.25	.339	2,634	15,843
Manchester, Iowa	do	420,360	Fingerlings, 1-4 inch	425.56	1.01	7,243	
Northville, Mich.	do	681,500	Fry	172.66	.2533	1,271	5,343
Do	Pond fishes	75,427	Fingerlings, 1-2 inch	537.95	7.13	10,742	72
Quincy, Ill.	do	82,844	Fingerlings, 1-6 inch	1,516.71	18.308	31,921	
Spearfish, S. Dak.	Trout	32,000	Fingerlings, 1-2½ inch	69.23	2.16	1,510	
Upper Mississippi collecting station.[b]	Pond fishes	139,711	Fingerlings, 1-6 inch	1,457.48	10.432	27,475	442
Do	do	3,682	Adults	106.56	28.94	1,777	
White Sulphur, W. Va.	Trout	365,700	Fingerlings, 1-4 inch	408.41	1.116	6,904	
Wytheville, Va.	do	242,134	Fingerlings, 1-3 inch	249.96	1.03	4,018	92

DISTRIBUTION BY STATION MESSENGERS.[c]

Name of station.	Species.	Number of fish.	Size.	Total cost.	Average cost per thousand.	Miles paid.	Miles free.
Baird, Cal.	Trout	14,000	Fry	$64.10	$4.578	1,403	
Do	do	20,000	Fingerlings, 1-inch	84.51	4.22	2,196	
Battery, Md.	Shad	400,000	Fry	5.70	.0142	68	
Do	Yellow perch	64,100,000	do	281.90	.00439	5,413	
Birdsview, Wash.	Trout	45,800	Fingerlings, 1-inch	91.25	1.99	2,016	
Bozeman, Mont.	do	79,000	do	84.50	1.069	1,162	
Do	do	263,200	Fingerlings, 1½-inch	160.10	.608	3,134	3,712
Do	do	29,500	Fingerlings, 2-inch	26.23	.889	615	
Do	do	3,400	Fingerlings, 2½-inch	12.65	3.72	137	
Do	Grayling	118,000	Fry	12.65	.107		
Bullochville, Ga.	Pond fishes	209	Adults	131.98	631.48	3,145	
Do	do	359,684	Fingerlings, 1-5 inch	1,459.59	4.057	32,311	4
Cape Vincent, N. Y.	Whitefish	11,900,000	Fry	108.22	.009	2,278	
Do	Pike perch	10,790,000	do	128.18	.0118	2,530	
Do	Trout	926,000	do	367.77	.397	8,426	31
Do	do	9,000	Fingerlings, 1-inch	13.12	1.46	560	
Do	Salmon	7,000	Fry	9.92	1.417		
Clackamas, Oreg.	Trout	127,000	Fingerlings, 2½-inch	126.45	.995	2,544	50

[a] Detached messenger shipments from cars. Cost in addition to "Distribution by car."
[b] La Crosse, Bellevue, and North McGregor.
[c] Distribution by station messengers includes cost of making distribution direct from the station without a car. This distribution is usually to near-by points.

METHOD OF DISTRIBUTION, BY STATIONS, SPECIES, NUMBER, AND SIZE OF FISH, AND COSTS—Continued.

DISTRIBUTION BY STATION MESSENGERS—Continued.

Name of station.	Species.	Number of fish.	Size.	Total cost.	Average cost per thousand.	Miles paid.	Miles free.
Craig Brook, Me	Trout	107,750	Fingerlings, 1–5 inch.	$217.73	$2.02	4,091	
Do	Salmon	11,600	Fingerlings, 2–3 inch.	117.45	10.124	2,284	
Do	Humpback salmon.	320,000	Fry	13.50	.0422	80	
Duluth, Minn	Whitefish	9,610,000	do	139.20	.014	263	
Do	Pike perch	23,100,000	Fry and eggs	148.12	.0064	5,062	
Do	Trout	10,295,000	Fry	593.60	.0576		
Do	do	516,580	Fingerlings, 1–2 inch.	318.43	.616	4,858	
Erwin, Tenn	do	497,360	Fingerlings, 1–4 inch.	832.11	1.67	15,413	352
Do	Pond fishes	24,820	Fingerlings, 2–4 inch.	272.06	10.97	7,051	40
Edenton, N. C	Shad	1,620,000	Fry	103.60	.064	2,656	36
Do	Pond fishes	16,900	do	120.70	7.142	2,785	
Do	do	25,200	Fingerlings, 1–3 inch.	249.38	9.896	5,507	31
Green Lake, Me	Trout	175,000	Fry	6.10	.0348	56	
Do	Smelt	3,000,000	do	92.54	.30801	2,284	
Do	Salmon	44,000	do	21.30	.484	304	
Homer, Minn	Pike perch	3,350,000	do	71.18	.212	1,114	
Do	Yellow perch.	200,000	do	4.79	.023	114	
Do	Pond fishes	35,245	Fingerlings, 2–6 inch.	560.88	15.91	12,362	
La Crosse, Wis	do	92,250	Fingerlings, 1–6 inch.	609.93	6.61	11,766	
Do	Trout	113,000	Fingerlings, 2 inch	33.58	.297	518	
Do	Pike perch	3,780,000	Fry	127.15	.03363	3,495	
Leadville, Colo	Trout	848,500	Fingerlings, 1–3 inch.	94.30	.111	8,804	
Louisville, Ky	Pond fishes	26,300	do	223.49	8.49	6,090	
Manchester, Iowa	Pike perch	2,900,000	Fry	88.49	.0305	2,802	
Mammoth Spring, Iowa.	Pond fishes	389,500	do	656.22	1.68	13,951	
Do	do	45,155	Fingerlings, 1–2 inch.	593.33	13.13	12,235	
Do	do	180	Adults	72.55	403.05	1,770	
Nashua, N. H	Trout	283,800	Fry	119.86	.42	2,775	
Do	Pond fishes	2,400	do	1.68	.70	28	
Do	Trout	10,000	Fingerlings, 1 inch	42.38	4.238	647	
Do	do	27	Adults	6.67	247.00	136	
Neosho, Mo	Pond fishes	3,310	Fry	27.62	8.34	646	
Do	do	73,378	Fingerlings, 1–7 inch.	530.88	7.23	15,095	
Do	do	330	Yearlings	22.76	68.97	590	
Do	Trout	156,387	Fingerlings, 1–3 inch.	225.60	1.44	5,410	
Northville, Mich	Whitefish	4,500,000	Fry	36.85	.00818		458
Do	Trout	4,205,000	Fry and eggs	96.28	.02289	1,396	1,806
Do	Pike perch	12,600,000	Fry	71.65	.00568	25	366
Do	Pond fishes	225,000	do	214.63	.953	3,643	3,594
Do	Grayling	25,000	do	6.00	.24		2,270
Do	Pond fishes	10,575	Fingerlings, 1–2 inch.	79.75	7.54	371	1,995
Do	Trout	79,500	Fingerlings, 1½ inch	89.87	1.13	532	2,707
Orangeburg, S. C.	Pond fishes	107,500	Fingerlings, 1 inch	194.75	1.81	3,773	
Quincy, Ill	Pike perch	1,600,000	Fry	34.10	.021	825	
St. Johnsbury, Vt.	do	52,400,000	do	338.95	.00646	5,936	
Do	Pond fishes	8,000	do	4.88	.61	264	
Do	do	5,475	Fingerlings, 1–3 inch.	133.55	24.392	1,206	
Do	Trout	1,474,300	Fry	314.52	.213	5,435	
Do	do	346,511	Fingerlings, 1–2½ inch.	336.89	.972	7,390	58
San Marcos, Tex	Pond fishes	347,002	Fingerlings, 1–4 inch.	843.75	2.43	49	24,125
Saratoga, Wyo	Trout	185,000	Fry	109.10	.59	1,334	184
Do	do	471,000	Fingerlings, 1–1½ inch.	294.16	.624	4,463	1,324
Spearfish, S. Dak.	do	525,000	do	190.87	.363	3,252	
Tupelo, Miss	Pond fishes	166,000	Fry	125.99	.759	1,918	
Do	do	143,000	Fingerlings, 1–6 inch.	693.88	4.852	13,335	44
White Sulphur, W. Va.	do	70,000	Fry	90.29	1.298	1,649	
Do	Trout	149,700	Fingerlings, 1–2 inch.	250.65	1.674	5,718	
Wytheville, Va	Pond fishes	29,000	Fry	31.11	1.07	663	
Do	do	42,641	Fingerlings, 1–6 inch.	309.82	7.265	7,395	
Do	Salmon	4,800	Fry	25.90	5.395	620	
Do	Trout	87,710	Fingerlings, 1–3 inch.	170.92	1.95	3,531	
Woods Hole, Mass	Flatfish	75,685,000	Fry	74.90	.000989	859	72

METHOD OF DISTRIBUTION, BY STATIONS, SPECIES, NUMBER, AND SIZE OF FISH, AND COSTS—Continued.

DISTRIBUTION BY CARS.[a]

Name of station.	Species.	Number of fish.	Size.	Total cost.	Average cost per thousand.	Miles paid.	Miles free.
Battery, Md.	Yellow perch.	11,000,000	Fry	$144.20	$0.0129	622	....
Beaufort, N. C.	Salt water	275	Adults	256.12	931.34	1,207	82
Bozeman, Mont.	Trout	1,571,350	Fry and fingerlings (2-inch).	1,050.08	.668	4,636	4,483
Craig Brook, Me.	Salmon	624,000	Fry and fingerlings (1-inch).	228.00	.365	600	....
Erwin, Tenn.	Trout	910,000	Fingerlings, 1–3 inch.	2,272.80	2.497	8,564	....
Green Lake, Me.	do	831,016	Fingerlings, 1-inch	454.70	.547	1,922	....
Do	Salmon	3,036,224	Fry	373.05	.123	2,066	....
Leadville, Colo.	Trout	2,028,146	Fingerlings, 1–3 inch.	1,063.96	.524	1,802	9,715
Manchester, Iowa.	do	1,025,567	Fingerlings, 1–4 inch.	1,628.67	1.58	8,140	....
Northville, Mich.	Pond fishes	88,933	Fingerlings, 1–3 inch.	1,192.77	13.40	6,159	....
Put in Bay, Ohio.	Pike perch	9,600,000	Fry	153.51	.016	631	....
Quincy, Ill.	Pond fishes	29,360	Fingerlings, 1–5 inch.	1,759.37	59.92	7,664	152
Spearfish, S. Dak.	Trout	92,000	Fingerlings, 1–2½ inch.	155.40	1.69	1,008	....
Upper Mississippi collecting station.[b]	Pond fishes	228,062	Fingerlings, 1–5 inch.	5,132.04	22.50	23,912	....
Do	do	7,846	Adults	1,055.25	134.49	7,743	....
White Sulphur, W. Va.	Trout	876,751	Fingerlings, 1–4 inch.	2,011.50	2.294	6,267	....
Wytheville, Va.	do	531,562	Fingerlings, 1–3 inch.	1,741.60	3.276	3,715	....

[a] Distribution by cars shows cost of transporting fish to destination or until delivered to car messenger.
[b] La Crosse, Bellevue, and North McGregor.

ALASKA FISHERIES AND FUR INDUSTRIES IN 1917

By WARD T. BOWER, *Agent*, and HENRY D. ALLER, *Assistant*

Appendix II to the Report of the U. S. Commissioner of Fisheries for 1917

99805°—19——14

CONTENTS.

FISHERY INDUSTRIES.

ALASKA FISHERIES AND FUR INDUSTRIES IN 1917.

By Ward T. Bower, *Agent Alaska Service*, and Henry D. Aller, *Assistant, Alaska Service.*

INTRODUCTION.

Broadly considered, the work of the Bureau of Fisheries in Alaska has been devoted to the enforcement of the laws and regulations for the protection of the fisheries and fur-bearing animals; the administration of the Pribilof Islands Reservation, and matters incidental thereto; the collection of statistics and the dissemination of information regarding the fisheries; the making of certain scientific investigations, chiefly in regard to the life history of the salmon and in connection with the fur-seal herd; and the conduct of fish-cultural operations.

In respect to the fisheries proper it may be said that much time has been given to the enforcement of the laws and regulations. Various prosecutions have been instituted when necessary from time to time. In the season of 1917 the Bureau was enabled to extend its patrol in southeastern Alaska by reason of having acquired two additional boats, the *Auklet* and the *Murre*. These boats were completed early in the year, having been designed especially for the Alaska fisheries service. Regular inspection of fishery operations was continued along the usual lines, and a census of the salmon ascending Wood River (Lake Aleknagik) was again made. Private hatcheries were inspected. Considerable work was also done in removing natural barriers in streams, thus opening them up to spawning salmon.

Hearings were held in regard to limiting or prohibiting salmon fishing in the waters of the Karluk, Bering, and Copper Rivers. As a result, formal orders were issued by the Department restricting fishery operations in these waters. Detailed statistics embracing practically all features of importance pertaining to the varied fishery industries of the Territory were assembled.

Important work undertaken in 1917 was the introduction in Alaska of the Scotch method of curing herring. For this work the Bureau sent to the Territory a fishery expert and a number of special assistants who gave practical demonstrations of the method to various interested persons.

In connection with the Pribilof Islands, attention was given to the support of the natives, the taking and preserving of fur-seal and fox skins and the repair and construction of dwellings occupied by the natives and of other buildings used for the general work of the Bureau. Collections of bones were made from the deposits on the killing fields of the Pribilof Islands. The steamer *Roosevelt* was used for the transportation of freight and passengers to and from

the Pribilofs in 1917. Two round trips, the second extending into January, 1918, were made from Seattle.

The period provided by law, in which the killing of fur seals at the Pribilof Islands was virtually limited to the food requirements of the native inhabitants, expired August 24, 1917, after which date the Department was free to resume the taking of skins for commercial purposes. The securing of skins to any considerable extent in the fall of the year, however, is necessarily restricted by reason of the so-called stagy season extending for a period of several weeks after August 24, unfavorable weather conditions, and the departure of the seals on the annual migration southward. An important feature of the work on the Pribilof Islands was the taking of a census of the fur-seal herd. During the year three sales of fur-seal skins and one of fox skins, products of the Pribilofs, were held at St. Louis, Mo.

The enforcement of the general law for the protection of the miscellaneous fur-bearing animals in Alaska remains as one of the duties of the Bureau. Field work was carried on by wardens and other employees of the Alaska service as far as practicable. Statistics of shipment of furs from Alaska were collected. A reconsideration of the method of cooperation on the part of the Post Office Department in respect to shipments of furs resulted in a more satisfactory arrangment being put in operation.

The authors of this report are indebted to Assistant Agent E. M. Ball for valuable aid in tabulating the statistics of the fisheries and in the preparation of much of the accompanying text.

EMPLOYEES, ALASKA SERVICE.

During the year 1917 the following regular employees have been identified with the Alaska service of the Bureau:

Regular Employees Identified with the Alaska Service in 1917.

Name.	Position.	Headquarters or chief place of duty.
Ward T. Bower	Chief agent	Washington, D. C.
Henry D. Aller	Assistant	Do.
Edward M. Ball	Assistant agent	Kodiak, Alaska.
Harry J. Christoffers	do	Seattle.
Ernest P. Walker	Inspector	Wrangell.
James H. Lyman	Assistant agent	Cordova
Harry C. Fassett	Agent and caretaker	St. Paul Island.
A. H. Proctor	do	St. George Island.
G. Dallas Hanna	Storekeeper	St. Paul Island.
William T. Miles	Physician	St. Paul and St. George Islands.
Henry P. Adams	do	St. George Island. (Resigned Nov. 21, 1917.)
William B. Hunter	do	St. Paul Island. (Appointed Nov. 22, 1917.)
George Haley	School-teacher	St. Paul Island.
Cora Giles Haley	do	Do.
Arnold C. Reynolds	do	St. George Island.
Calvin F. Townsend	Warden	Fairbanks.
Fred H. Gray	do	Wrangell.
Shirley A. Baker	do	Dillingham.
Harry H. Brown	do	Nushagak. (Resigned Apr. 20, 1917.)
Christian L. Larson	do	Chicken.
Henry C. Scudder	do	St. Paul Island and Wrangell.
Jesse L. Nevill	do	Wrangell. (Appointed June 17, 1917.)
Charles E. Crompton	do	St. Paul Island. (Appointed May 3, 1917.)
Edwin Hofstad	Master steamer Osprey	Wrangell.
Albert K. Brown	Clerk	Washington, D. C.
Mary S. Haines	do	Do.
William P. Rasin	do	Do.
E. Elaine Bell	do	Seattle.

Regular Employees at Government Hatcheries in Alaska in 1917.

Name and location.	Position.
Afognak:	
Edwin Wentworth	Superintendent.
G. C. Robertson	Foreman.
John Naumoff	Fish-culturist. (Resigned Nov. 15, 1917.)
W. E. Sullivan	Fish-culturist.
Alfred Nelson	Apprentice fish-culturist.
Nicolai Boskofsky	Apprentice fish-culturist. (Resigned Nov. 30, 1917.)
Russell Noyes	Apprentice fish-culturist.
F. J. Stewart	Cook.
Yes Bay:	
Charles B. Grater	Superintendent.
C. H. Van Atta	Foreman.
Kenneth P. Hutton	Fish culturist.
J. H. Tierney	Do.
Clarence B. Rivers	Apprentice fish-culturist.
C. N. Blystad	Do.
T. H. Morton	Apprentice fish-culturist. (Resigned Dec. 31, 1917.)
M. T. Tierney	Cook.

FISHERY INDUSTRIES.

As in similar reports for previous years, the Territory of Alaska is here considered in the four coastal geographic sections generally recognized as follows: Southeast Alaska, embracing all that narrow strip of mainland and the numerous adjacent islands from Portland Canal northwestward to and including Yakutat Bay; central Alaska, the region on the Pacific from Yakutat Bay westward, including Prince William Sound, Cook Inlet, and Chignik; western Alaska, the shores of Bering Sea, tributary waters, and the islands in Bering Sea; and arctic Alaska, all that portion of Alaska facing on or tributary to the Arctic Ocean.

Detailed reports and statistical tables dealing with the various fishery industries are presented herewith, and there are also given the important features of certain subjects which were the object of special investigation or inquiry.

WATERS CLOSED TO COMMERCIAL FISHING.

Section 6 of the act approved June 26, 1906, for the protection and regulation of the fisheries of Alaska, is as follows:

That the Secretary of Commerce may, in his discretion, set aside any streams or lakes as preserves for spawning grounds, in which fishing may be limited or entirely prohibited; and when, in his judgment, the results of fishing operations in any stream, or off the mouth thereof, indicate that the number of salmon taken is larger than the natural production of salmon in such stream, he is authorized to establish close seasons or to limit or prohibit fishing entirely for one year or more within such stream or within five hundred yards of the mouth thereof, so as to permit salmon to increase: *Provided, however*, That such power shall be exercised only after all persons interested shall be given a hearing, of which due notice must be given by publication; and where the interested parties are known to the Department they shall be personally notified by a notice mailed not less than thirty days previous to such hearing. No order made under this section shall be effective before the next calendar year after same is made: *And provided further*, That such limitations and prohibitions shall not apply to those engaged in catching salmon who keep such streams fully stocked with salmon by artificial propagation.

Pursuant to the provisions of this section action was taken in 1917 in respect to the waters of Karluk, Bering, and Copper Rivers.

Under date of July 31, 1917, announcement was made of a hearing to be held in respect to the Karluk River. The text of the announcement was as follows:

Whereas it has been recommended that the Secretary of Commerce limit or prohibit all fishing in Karluk River and Lagoon, and tributary waters, Alaska, notice is hereby given under the provisions of section 6 of the act of Congress approved June 26, 1906, entitled "An act for the protection and regulation of the fisheries of Alaska," that a hearing to determine the advisability of limiting or prohibiting fishing operations in the above-named waters will be held in room 328, customhouse, San Francisco, Cal., on November 15, 1917, at 10 o'clock a. m., at which time and place all persons interested will be heard.

Following the hearing on November 15, 1917, the Department under date of November 30, 1917, promulgated the following order:

A hearing having been given at San Francisco, Cal., November 15, 1917, after due notice in accordance with law, for the purpose of determining the advisability of

establishing a salmon-breeding reserve of certain waters in Alaska, and all persons having had full opportunity to be heard, it is hereby ordered, by virtue of the authority vested in me by section 6 of "An act for the protection and regulation of the fisheries of Alaska," approved June 26, 1906, that until further notice all fishing for salmon, or other fishing in the prosecution of which salmon are taken or injured, excepting only the native Indians taking limited numbers of salmon for their own consumption and not for sale or barter, be and is hereby prohibited in waters of Alaska, as follows: In Karluk River and Lagoon and all tributary waters.

This order becomes effective January 1, 1918.

Under date of September 24, 1917, announcement was made of a hearing to be held in respect to Bering River. The text of the announcement was as follows:

Whereas it has been recommended that the Secretary of Commerce limit or prohibit commercial fishing for salmon, or other commercial fishing in the prosecution of which salmon are taken or injured, in Bering River and all tributary waters, including Bering Lake, above a line extending at right angles across Bering River from a point approximately 800 feet northwesterly from the mouth of Gandil River, Alaska, notice is hereby given under the provisions of section 6 of the act of Congress approved June 26, 1906, entitled "An act for the protection and regulation of the fisheries of Alaska," that a hearing to determine the advisability of limiting or prohibiting fishing operations in the above-named waters will be held at the office of the Bureau of Fisheries, 1217 L. C. Smith Building, Seattle, Wash., on November 20, 1917, at 10 o'clock a. m., at which time and place all persons interested will be heard.

Following the hearing on November 20, 1917, the Department under date of November 30, 1917, promulgated the following order.

A hearing having been given at Seattle, Wash., November 20, 1917, after due notice in accordance with law, for the purpose of determining the advisability of establishing a salmon-breeding reserve of certain waters in Alaska, and all persons having had full opportunity to be heard, it is hereby ordered, by virtue of the authority vested in me by section 6 of "An act for the protection and regulation of the fisheries of Alaska," approved June 26, 1906, that until further notice all fishing for salmon, or other fishing in the prosecution of which salmon are taken or injured, be and is hereby prohibited in waters of Alaska, as follows: Bering River and all tributary waters, including Bering Lake, above a line extending at right angles across Bering River from a point approximately 800 feet northwesterly from the mouth of Gandil River, Alaska.

This order becomes effective January 1, 1918.

Under date of November 1, 1917, announcement was made of a hearing to be held in respect to the Copper River. The announcement was as follows:

Whereas it has been recommended that the Secretary of Commerce limit commercial fishing for salmon, or other commercial fishing in the prosecution of which salmon are taken or injured, in Copper River and its delta, and in all tributary waters, in Alaska, notice is hereby given under the provisions of section 6 of the act of Congress approved June 26, 1906, entitled "An act for the protection and regulation of the fisheries of Alaska," that a hearing to determine the advisability of limiting fishing operations in the above-named waters will be held at the office of the Bureau of Fisheries, 1217 L. C. Smith Building, Seattle, Wash., on December 14, 1917, at 10 o'clock a. m., at which time and place all persons interested will be heard.

Following the hearing on December 14, 1917, the Department under date of December 29, 1917, promulgated the following order:

A hearing having been given at Seattle, Wash., December 14, 1917, after due notice in accordance with law, for the purpose of determining the advisability of establishing a salmon-breeding reserve of certain waters in Alaska, and all persons having had full opportunity to be heard, it is hereby ordered, by virtue of the authority vested in me by section 6 of "An act for the protection and regulation of the fisheries of Alaska," approved June 26, 1906, that until further notice all fishing for salmon or other fishing in the prosecution of which salmon are taken or injured, in the Copper River and its delta and all tributary waters, Alaska, be and is hereby made subject to the following limitations and prohibitions in addition to the general restrictions already applicable by virtue of existing laws and regulations:

1. Commercial fishing is prohibited in all waters of the Copper River delta from 6 a. m. on January 1 to 6 a. m. on June 1 of each year, and in the waters of Miles Lake and Abercrombie Canyon from 6 a. m. on January 1 to 6 a. m. on June 5 of each year.

2. A weekly close season from 6 p. m. Saturday to 6 a. m. of the Monday following shall be observed in all of the waters herein referred to in which fishing is permitted.

3. Commercial fishing in the waters of the delta shall be limited to set nets, stake nets, and drift gill nets: *Provided, however,* That the four existing traps east of Cape Whitshed may be continued in operation, but without change of location or increase in size. No stake net, set net, or drift gill net shall exceed 1,000 feet in length. Only one stake net or set net shall be extended out from shore from one location, and no offshore stake nets or set nets will be permitted; the lateral distance interval between all such nets in the waters of the delta shall be not less than 1,800 feet.

4. All fishing is prohibited from the head of the delta to the foot of Miles Lake at all times.

5. All fishing in Miles Lake shall be limited to stake nets and set nets. No such net shall exceed 600 feet in length, and only one such net shall be extended out from shore from one location; no offshore nets will be permitted in the lake. The lateral distance interval between all nets in Miles Lake shall be not less than 600 feet.

6. Fishing in Abercrombie Canyon shall be restricted to the use of dip nets operated by hand, such nets not to exceed 16 inches in greatest diameter and only one dip net shall be operated by a person. On the east side of the canyon there shall be distance intervals of at least 300 feet between fishermen operating dip nets. No fishing will be permitted in the so-called Bear Holes, near the upper end of Abercrombie Canyon.

7. No fishing will be permitted at any time in the waters of the Copper River above Abercrombie Canyon, or in any of the waters tributary thereto, except in the case of local residents who may take limited numbers of salmon for domestic use: *Provided,* That such fishing shall at no time be upon the spawning grounds of any salmon.

8. No set net or stake net shall be operated in any other than substantially a straight line.

9. For the purposes herein considered, the delta of the Copper River will be regarded as including all waters south of an east-and-west line passing through Mile 27 on the Copper River & Northwestern Railway, as at present established, and inside of a line from Point Martin to Cape Whitshed drawn so as to include the waters of the Martin Islands, the Egg Islands, and all tidal flats and islands between.

10. The lower end of Miles Lake shall be considered as at the bridge of the Copper River & Northwestern Railway at Mile 49. The upper end of Miles Lake shall be considered as at a point near Mile 52½ on the Copper River & Northwestern Railway where the river loses its identity in the lake, this point to be as indicated by notices posted by duly authorized representatives of the Bureau of Fisheries.

11. Abercrombie Canyon shall be considered as extending from the upper end of Miles Lake to Tunnel Point, near Mile 53½ on the Copper River & Northwestern Railway.

12. For the purposes of this order the following definitions are adopted to apply to the words in question where the same are used: "Stake net," a gill net attached or affixed to piles or stakes. "Set net," an anchored gill net.

This order becomes effective January 1, 1918.

Previous orders by the Secretary of Commerce place special limitations and inhibitions upon operations in the following waters: In western Alaska—Wood and Nushagak Rivers; in central Alaska—all streams flowing into Cook Inlet, Eyak Lake, and a limitation on fishing in Eyak River; in southeast Alaska—Anan Creek, Naha Stream, all waters tributary to Barnes Lake, Prince of Wales Island, Hetta Creek and its tributary waters and the region within 500 yards of the mouth of said creek; and Sockeye Creek, its tributary Boca de Quadra waters, and the region within 500 yards of the mouth of said creek. By authority of Executive order and proclamation, limitations have been placed upon fishing in the following additional waters: Afognak Reservation, Aleutian Islands Reservation, Yes Bay and Stream, and the Annette Island Fishery Reserve.

STREAM IMPROVEMENT.

Consideration has been given during the year to plans for improving and opening up a number of salmon streams in southeastern Alaska inaccessible to salmon because of falls or other natural barriers. This matter has been under the general supervision of Inspector Walker, of the Alaska service. He has reported that the obstructions may be grouped into four general classes: (1) Falls caused by rock ledges or strata that have not been worn away; (2) log jams resulting either from natural causes or from artificial obstructions; (3) rock jams consisting of loose rocks or bowlders in such position as to be barriers in themselves or to cause the currents to be so broken that fish can not pass through them; and (4) dams constructed for power purposes, and occasionally dams built by beavers.

Some of the log jams change from time to time, increasing generally in size and impenetrability. They are of two general classes—(*a*) those where the water flows over the top of the jam and (*b*) where it trickles through spaces between the logs.

Such barriers as log jams or falls ordinarily absolutely prevent the passage of fish, but in some cases at certain stages of the water a few salmon may be able to pass. Some of the obstructions are not particularly formidable, while others are extensive and will necessitate a great deal of work to open the way for the passage of salmon. Not infrequently small barriers prevent absolutely the ascent of salmon to excellent spawning grounds of considerable extent. The practical results of thus increasing the natural spawning areas are obvious.

In June and July, 1916, improvements were made on Skog Creek on Kupreanof Island, opposite Scow Bay, and at a salmon stream at Pavlof Harbor, near the entrance of Freshwater Bay, on Chichagof Island. Both of these streams were so improved that salmon may now readily ascend the falls. The success of this work clearly shows the need of extensions to other streams as fast as time and funds permit.

ALASKA FISHERY INTELLIGENCE SERVICE.

A senate joint memorial passed by the legislature of Alaska in April, 1917, requested that the Bureau of Fisheries in conjunction with the Washington–Alaska Military Cable and Telegraph System arrange that the prices of fresh fish at Seattle and Ketchikan be bulletined every day at the cable office of every town on the Alaska coast where fishing vessels call for the purpose of shipping fish southward and that once a week the prices of salt fish of the varieties caught in Alaska waters be bulletined at the cable offices of the coast.

The War Department, which operates the Washington–Alaska Military Cable and Telegraph System, expressed its willingness to receive, transmit, and post bulletins furnished by the Bureau of Fisheries, and early in July the service was initiated. At first the work was limited to information regarding Seattle prices, but was soon extended to include prices at Ketchikan. The intelligence service as finally fixed upon included: (1) Forwarding each day, Sundays and holidays excluded, to Juneau, Petersburg, Ketchikan, Wrangell, Sitka, Valdez, Seward, Cordova, and Skagway the Seattle

prices at noon for fresh halibut, sablefish, and red rockfish; (2) inclusion with the Seattle quotations on Monday of each week the prices of pickled sablefish, salmon, and herring; and (3) furnishing from Ketchikan local information, corresponding to that furnished from Seattle, to the other Alaska towns supplied with the Seattle quotations.

The purpose of this service is to keep the fishermen in touch with market conditions that they may dispose of their catches more profitably and thereby be induced to increase the production of fish. The service has met with general favor.

PATROL BOATS.

With the development of the fishery resources of Alaska from year to year, new localities are fished and new canneries and other fishery establishments are built. With each extension of activities, the territory that must be patrolled by the field agents of the Bureau is increased, but the facilities for covering the various districts remain extremely inadequate. Until 1917, the *Osprey* (23 tons) was the only Government boat engaged in a patrol of the fisheries of Alaska, being assigned to the southeastern district. In October, 1916, this vessel was brought to Seattle for repairs and did not return to Alaskan waters until January, 1918.

In December, 1916, a contract was made for the construction of two patrol boats, each to be 48 feet in length, 12½ feet in breadth, and equipped with a 25–30 horsepower heavy-duty Standard engine. These boats, the *Murre* and *Auklet*, were completed and put in commission in July, 1917, and immediately proceeded to Alaska, where they were engaged in patrol work during the remainder of the season. They are of plain and substantial construction similar to the seaworthy type of purse-seine boat familiar to the Pacific coast.

The schooner *Nimrod* (8 tons) was chartered for work along the central coast of Alaska from Cook Inlet to False Pass during the summer months. The launches *Angelus* and *Buzzard* were chartered at different times for use in patrol work on Prince William Sound. A small launch was hired also for brief service in the Nushagak region.

The representatives of the Alaska service in central and western Alaska are not able to cover the districts to which they are assigned without some assistance from the canning companies. As usual, several of the companies furnished free transportation to the agents in those districts. Were it not for these gratuities, much of the territory could not be visited, as suitable boats can not be chartered. Gratuitous service of this character is wrong in principle, but until Congress provides additional funds for more vessels, there appears to be no alternative in the case of those employees of the Bureau who are called to certain remote and inaccessible regions.

VIOLATIONS OF LAWS AND REGULATIONS.

Prosecutions for violations of the fishery laws and regulations were made for disregard of the weekly close season, for the operation of gear within the prohibited distance of other gear, and for failure to provide pound nets with distinctive signs whereby ownership could be determined.

A complaint was made before the United States commissioner at Ketchikan on August 18, 1917, against J. S. Hume, superintendent of the Nakat Inlet cannery of the G. W. Hume Co., charging the operation of a trap on the north shore of Kanagunut Island on August 6 and 7 without a sign bearing the name, number, or other distinctive mark, contrary to the general regulations promulgated under the authority of section 11 of the act of June 26, 1906. The case was called for trial on August 24, at which time a plea of guilty was entered, whereupon a fine of $25 and costs was imposed.

On August 24, a complaint was made before the United States commissioner at Wrangell against Frank Adams, who was charged with unlawful fishing on Sunday, August 12, and with the setting of nets in the Stikine River for a distance greater than one-third the width of the channel. A plea of guilty being entered, the defendant was discharged upon payment of the costs of the case.

In October, 1917, the grand jury at Juneau indicted the Alaska Pacific Fisheries for four violations of the fishery law during the season of 1917. Two of these indictments alleged that the company operated two traps on Lynn Canal, one each at Sand Spit and Seduction Point, without proper signs to indicate their ownership; another charged a nonobservance of the weekly close period in respect to a trap operated at Idaho Inlet on August 11. The remaining indictment was based upon the allegation that the company on or about August 15 installed a floating trap within less than 600 yards laterally of a trap then in operation by the Thlinket Packing Co., near Village Point on the north shore of Icy Strait. When these cases were called for trial at Juneau on December 15, pleas of guilty were entered in respect to the operation of traps on Lynn Canal and Idaho Inlet as alleged, and fines of $300 and costs and $500 and costs were paid, respectively. The case involving an encroachment on the distance interval between traps was called but was continued until a term of the court to be held in the spring of 1918.

The Northwestern Fisheries Co. was also indicted by the grand jury at Juneau in October for a violation of the weekly close season on Sunday, August 26, 1917. A pound net in Tolstoi Bay on the east coast of Prince of Wales Island was found to be improperly closed. The case was called for trial at Ketchikan on November 15, when the company pleaded guilty. A fine of $500 was paid.

On Sunday, August 12, 1917, the heart walls of nine traps operated by the Deep Sea Salmon Co. in Port Althorp were found not to be adjusted in accordance with law. This matter was taken before the United States commissioner at Juneau on October 5, formal charge being made against Jens Kvalvik, trap foreman, who entered a plea of guilty, whereupon a fine of $250 was imposed.

The Alaska Packers Association was convicted of the wanton waste of salmon on Cook Inlet in 1914 at a term of the district court held at Valdez in September, 1916. The case was carried to the circuit court of appeals at San Francisco which, in an opinion delivered in the summer of 1917, upheld the lower court.

The case against the Canoe Pass Packing Co. charging the wanton waste of salmon on July 22 and 23, 1916, at Windy Bay, Prince William Sound, came to trial at Cordova in April, 1917, and resulted in an acquittal of the company.

On April 9, 1917, the Carlisle Packing Co. was arraigned in the district court at Cordova for three violations of the fishery laws in July, 1916. The company pleaded guilty and a fine was imposed for each offense.

A complaint was filed in the United States commissioner's court at Cordova on September 15, charging Frank Lee with unlawful fishing in Eyak River. The defendant pleaded guilty and paid a fine of $5.

On September 11, 1917, Joe Enos was brought before the United States commissioner at Fairbanks and charged with unlawful fishing in Clear Creek. He entered a plea of guilty and paid a fine of $25 and the costs of the prosecution, which amounted to an additional $10.15.

TERRITORIAL LEGISLATIVE NOTES.

The Legislature of the Territory of Alaska, at its third regular biennial session at Juneau in 1917, amended sections 1 and 2 of the Territorial revenue act of April 29, 1915, chapter 76, Laws of Alaska, 1915. The changes, in so far as they affect the fishery industry, provide for increased tax rate on all canned salmon, kings, reds, or sockeyes being taxed 4½ cents per case, medium reds 2½ cents per case, and all others 2 cents per case. This is an increase of one-half cent per case on kings, reds, and medium reds, and 1 cent per case on pinks and chums. The tax on salted or mild-cured fish remains unchanged at 2½ cents per 100 pounds, as does also the tax of $100 per annum on all fish traps. The tax of $1 per 100 fathoms on gill nets was repealed. Cold-storage plants are taxed according to the amount of annual business, which was determined formerly on the basis of the purchase price of product, but now upon the gross amount received for the product and for storage of produce for others. Fish oil is taxed at the rate of $2 per barrel when manufactured wholly or in part from herring; fertilizer and fish meal made wholly or in part from herring are taxed at the rate of $2 per ton. The act, approved May 3, 1917, as it applies to fisheries is as follows:

Section 1. That Sections 1 and 2 of Chapter 76, Laws of Alaska, 1915, approved April 29, 1915, be and the same are hereby amended to read as follows:

"Section 1. That any person, firm or corporation prosecuting or attempting to prosecute any of the following lines of business in the Territory of Alaska shall apply for and obtain a license and pay for said license for the respective lines of business as follows:

* * * * * * *

"Sixth. Fisheries: Salmon canneries, four and a half cents per case on King and Reds or Sockeye; Two and a half cents per case on Medium Reds; two cents per case on all others.

"Seventh. Salteries: Two and one-half cents per one hundred pounds on all fish salted or mild cured, except herring.

"Eighth. Fish Traps: Fixed or floating, one hundred dollars per annum, so-called dummy traps included.

"Ninth. Cold-Storage Plants: Doing a business of one hundred thousand dollars per annum or more, five hundred dollars per annum; doing a business of seventy-five thousand dollars per annum and less than one hundred thousand dollars, three hundred and seventy-five dollars per annum; doing a business of fifty thousand and less than seventy-five thousand dollars per annum, two hundred and fifty dollars per annum; doing a business of twenty-five thousand and less than fifty thousand dollars per annum, one hundred and twenty-five dollars per annum; doing a business of ten thousand dollars and less than twenty-five thousand dollars per annum, fifty dollars per annum; doing a business of four thousand, and less than ten thousand dollars per annum; twenty-five dollars per annum; doing a business of under four thousand

dollars per annum, ten dollars per annum. The 'annual business' under this section shall be considered the gross amount received for the product and for storage of produce for others.

"Tenth. Fish-Oil Works: Using Herring in whole or in part in the manufacture of fish oil; two dollars per barrel.

"Fertilizer and fish-meal plants: Manufacturing Fertilizer and Fish Meal in whole or in part from herring; two dollars per ton."

The legislature also appropriated $80,000 for use in the construction and operation of fish hatcheries, and for the protection and care of the natural spawning grounds in the Territory, and also provided that the governor of Alaska shall appoint a board of three fish commissioners, of which he shall be a member ex officio, whose duty it shall be to direct the work of propagating fish and caring for their spawning grounds, with authority to appoint a general hatcheries superintendent who shall select the locations of hatcheries and provide a working force for each establishment. The general hatcheries superintendent is also directed to supervise spawning operations, and where it is possible to collect more eggs than the hatcheries will accommodate, to take and plant this excess quantity in the beds of rivers and creeks.

In respect to the increased license tax referred to above, the Territorial treasurer of Alaska wrote the Commissioner of Fisheries on April 10, 1918, as follows:

The purpose of the Territorial Legislature in increasing the tax rate on the several classes or varieties of canned salmon was, by agreement with the fisheries interests, to provide for a "fish-hatcheries fund;" the moneys from such fund to be available for "building and operating fish hatcheries and for the protection and care of natural spawning grounds in the Territory of Alaska." Figuring that the increase would net an additional $40,000 per annum, both branches of the 1917 legislative assembly passed a measure which provided for the setting aside of a fund in amount of $80,000, same to be available for expenditure for the purposes mentioned during the biennium ending March 31, 1919. However, although passed by both houses, the bill was misplaced and was not transmitted to the governor for approval until several days after adjournment; the legality, therefore, of the measure is questioned, and to date the fund provided for has not been set aside nor have any disbursements been made in this connection.

TERRITORIAL LICENSE TAX.

Information has been received from the Territorial treasurer of Alaska in respect to tax collections made for the fiscal year ending December 31, 1917, under the several fisheries schedules of the Territorial tax law. The following is a statement of receipts as of April 9, 1918:

FISHERY LICENSE TAXES COLLECTED BY TERRITORY FOR THE FISCAL YEAR ENDED DEC. 31, 1917.

Schedule.	Division No. 1.	Division No. 2.	Division No. 3.	Total.
Canneries	$72,657.86	$91.58	$111,064.45	$183,813.89
Salteries	1,011.36	16.60	2,316.97	3,344.93
Fish traps	33,906.00	100.00	15,200.00	49,206.00
Cold-storage plants	1,225.00		250.00	1,475.00
Total	108,800.22	208.18	128,831.42	237,839.82

The Territorial treasurer advises that the above collections closely approximate the amount of taxes due for the fiscal year 1917. Under the provisions of the Territorial tax law of 1915 the total collections reported for the two years 1915 and 1916 amounted to only $62,145.69. Thus the Territorial tax collected in 1917 is nearly four times the sum similarly collected for the two preceding years.

WOOD RIVER CENSUS.

A count was made in 1917 of the salmon ascending Wood River to spawn. With the exception of 1914, similar counts have been made in previous years beginning with 1908. The rack across the outlet of Lake Aleknagik, the lowermost of the Wood River series of lakes, was put in order in June. The counting of salmon began June 26 and was continued daily until August 1. The census was taken by Kenneth P. Hutton, fish-culturist at the Yes Bay station, temporarily detailed for this duty.

In this connection it may be stated that in the Bristol Bay region the salmon were several days later in arriving than in 1916, which circumstance caused the packers some concern over the probability of a light run. There was no obvious reason for the delay in the run. Although the previous winter had been exceptional in many respects, sudden freezes and high winds being followed by equally sudden thaws and heavy snows, it broke about the usual time and on June 1 Lake Aleknagik and Wood River were free from ice. And with the extreme high water in the rivers, resulting from the spring thaw, conditions were such as to presage an early appearance of the salmon.

The first large count at the Wood River rack was made July 6, when 79,707 salmon entered the lake. The largest count of the season occurred on July 11, at which time 180,683 salmon passed through the rack. The heavy run continued nine days, from July 6 to 14, the count on the last day of this period being 104,000. On the following day, July 15, only 7,706 were counted. From July 18 to 21 the run increased slightly, 72,258 being counted July 19, but thereafter it declined rapidly, and counting was discontinued August 1, which was 11 days earlier than in 1916. From July 11 to 14 a total of 529,538 salmon were counted as passing into Lake Aleknagik; this is almost equal to the number admitted during the entire season of 1916. It is probable that in proportion to the size of the run a larger number of salmon escaped the nets of the fishermen in 1917 than in the preceding season, as a result of the storms which interrupted operations during the summer.

The total count in 1917 was 1,081,508. Corresponding figures for previous years are as follows: In 1916, 551,959; in 1915, 259,341; in 1913, 753,109; in 1912, 325,264; in 1911, 354,299; in 1910, 670,104; in 1909, 893,244; and in 1908, 2,600,655. The tally of salmon at the Aleknagik rack in 1917 is shown in detail in the following table:

Wood River Salmon Census in 1917.

Date.	Number.	Date.	Number.	Date.	Number.
June 26	261	July 9	75,635	July 22	5,753
27	480	10	76,150	23	7,029
28	381	11	180,683	24	4,373
29	10	12	139,431	25	2,104
30	....	13	105,424	26	2,077
July 1	9	14	101,000	27	1,041
2	197	15	7,706	28	1,933
3	370	16	16,133	29	484
4	439	17	5,065	30	654
5	9,368	18	20,423	31	367
6	79,707	19	72,258	Aug. 1	111
7	59,735	20	32,963		
8	54,497	21	14,257	Total	1,081,508

It was reported that out of this number there were not more than 100 humpback and 30 king salmon, the run being almost entirely red salmon. It was also estimated that 20 per cent of the salmon entering the lake showed gill-net marks and injuries from other causes. This is a much higher percentage of marked salmon than was noted in 1916.

Recognition of the cooperation of the Alaska Packers Association and of the Alaska-Portland Packers' Association in the construction of rack and count of salmon is here given.

ALEUTIAN ISLANDS RESERVATION.

The establishment of the Aleutian Islands Reservation and the details of its administration have been explained in corresponding reports on the Alaska fisheries and fur industries for previous years. No change was made in any particular in the year 1917.

The Department has continued to encourage the development of the fisheries of the reservation and has acted favorably on every application for a permit to carry on fishery operations there unless it appeared quite clearly that the proposed undertaking would not subserve the public interests. It is the policy of the Department that as far as practicable natives of the reservation shall have employment in connection with all fishery operations.

In the year 1917 the Department issued 13 new fishery permits. These permits covered operations of considerable diversity. One permit authorized whaling operations, and one the construction of a salmon cannery. Most of the other permits had reference to the salting of cod and salmon and to dealing in fresh fish.

AFOGNAK RESERVATION.

Under the terms of the Department's order of March 21, 1912, amended February 6, 1913, commercial fishing may be carried on within the Afognak Reservation by such natives and white men married to native women as were living on Afognak Island and the smaller adjacent islands at the time of the promulgation of the order. To prevent abuses of the privilege thus granted, the Bureau has supervised each season all commercial operations and maintained a patrol of the reserved waters during the time of active fishing. Alfred Nelson, apprentice fish-culturist at the Afognak hatchery, was detailed to perform this work during the summer of 1917, under the direction of the agent in charge of the district. He was authorized

to issue the permits to those who made application for and were entitled to them. It had been the custom to issue special regulations to prevent overfishing, but on account of the great need and demand for fishery products it seemed advisable this year to waive all special regulations respecting gear and close seasons heretofore imposed, except to prohibit all operations in Afognak Bay, or Litnik Bay, as it is often called, and Pauls Bay, where the salmon were required for fish-cultural purposes.

Fifty-six natives availed themselves of the privilege to fish. They grouped themselves into gangs of from four to six men each, and early in June repaired to fishing grounds of their own selection. Fishing gear, consisting chiefly of seines, was furnished in every case except one by the Kadiak Fisheries Co.

Operations were carried on at six localities each of which, except Little Afognak, showed a larger production of fish than in 1916. There is satisfaction in noting that these streams are slowly recovering from the effects of the volcanic eruption in 1912, as evidenced by the increased production in 1917, which though somewhat under the average yield for the seasons preceding that disaster, is encouraging to the extent that from now on each season should show improvement over the preceding one until normal conditions are regained.

Little Afognak retained first place in the production of red salmon, although the catch fell off slightly more than one-third, there having been a decline from 34,898 in 1916 to 22,157 in 1917. Izhut Bay, which was reported as having produced none in 1916, took second place with a yield of 17,638 red salmon. Paramanof led in the production of humpbacks, 55,924 having been taken as against none in 1916; Danger Bay took second place with 22,581 fish of this species, and Seal Bay third with 20,342. In the order of their production of all species of salmon, Paramanof took first place, while Seal, Izhut, and Danger Bays followed in the order named, leaving Little Afognak in fifth place as against a leading position in 1916. Taking the reservation as a whole, a comparison of catches for 1916 and 1917 shows that sockeyes increased from 46,311 to 71,527, and humpbacks from 5,470 to 107,333, while cohos declined from 21,267 to 3,558. No kings or chums were taken.

It was reported that the run of sockeyes to Afognak Bay was unusually heavy, exceeding that of any year since the hatchery began operations, in consequence of which a large collection of eggs was made.

The following table shows, by localities and species, the number of salmon taken commercially from the waters of the Afognak Reservation:

CATCH OF SALMON IN THE AFOGNAK RESERVATION, SEASON OF 1917.

Localities.	Sockeyes.	Cohos.	Humpbacks.	Total.
Malina	11,516	....	1,315	12,831
Paramanof	13,042	185	55,924	69,151
Seal Bay	6,990	462	20,342	27,794
Little Afognak	22,157	1,496	261	23,914
Izhut Bay	17,638	....	6,910	24,548
Danger Bay	184	1,415	22,581	24,180
Total	71,527	3,558	107,333	182,418

The natives were paid approximately $4,800 for this catch of fish, all of which was sold to the Kadiak Fisheries Co., at Kodiak.

The following table indicates the method of capture of each species and the approximate beginning and ending of the fishing season in each locality:

Apparatus and Approximate Fishing Season, Afognak Reservation, 1917.

Localities.	Seined.			Gilled: Sockeyes.	Fishing season.	
	Sockeyes.	Cohos.	Humpbacks.		Began.	Ended.
Malina	11,056	....	1,315	460	June	August.
Paramanof	12,964	185	55,924	78	...do	Do.
Seal Bay	6,990	462	20,342	....	July	Do.
Little Afognak	21,651	1,496	261	506	June	September.
Izhut Bay	17,638	....	6,910	....	July	August.
Danger Bay	184	1,415	22,581	....	August	September.
Total	70,483	3,558	107,333	1,044		

ANNETTE ISLAND FISHERY RESERVE.

The Annette Island Fishery Reserve was created by a presidential proclamation dated April 28, 1916, and includes certain waters surrounding Annette Island and a number of smaller adjacent islands in southeastern Alaska. The reserve was created for the benefit of the Metlakatlans and other Alaskan natives in residence on these islands. The use of the reserved waters for fishery purposes must be in accordance with the general fisheries laws and regulations of the United States as administered by the Secretary of Commerce. The interests of the Metlakatlans and other natives on the islands in question are looked after by the Bureau of Education, Department of the Interior, in connection with the discharge of its general duties to the natives of Alaska.

The lease entered into by the Department of the Interior on May 4, 1916, with P. E. Harris for the operation of a cannery on Annette Island, was rendered inoperative on account of the burning of the cannery on May 17, 1916. A subsequent lease was accordingly entered into with the Annette Island Packing Co., Seattle, Wash. The new lease provides for the use of a site for a salmon cannery and for fish-trap rights. The lease runs for five years beginning with 1918. In 1917 the lessees began the construction of the proposed cannery, and canning operations are expected to begin in 1918. The lessees pay an annual permit fee of $100 for each fish trap erected on the reserve and a royalty of 1 cent per salmon for all salmon taken in the traps. Beginning with 1918, annual payments aggregating not less than $6,000 are guaranteed by them. As far as practicable the natives are to be employed for all fishery operations, exception being made in certain instances where skilled labor is required.

The lessees had the privilege of operating fish traps in the reserved waters in 1917. For this privilege a payment of not less than $4,000 was guaranteed by them. According to information furnished by the Bureau of Education, six traps were operated, resulting in a take of 472,505 salmon.

The Bureau of Education expresses the hope that the money which the natives receive as the result of the lease will make it possible for them to purchase the interests of the lessees upon the termination of the five-year period and then to operate the cannery themselves under proper supervision.

INJURY TO FISHERIES BY BIRDS.

In 1914 and 1915 E. P. Walker, inspector in the Alaska fisheries service, made some inquiries into the destruction of herring by predatory birds, particularly gulls and ducks, and reported that an enormous quantity of herring eggs was destroyed each season by these birds in the vicinity of Craig and Sitka, where large numbers of herring spawn. As a result of these observations, the Bureau gave careful consideration to the formulation of measures designed to overcome agencies destructive to the herring fishery. In the meantime a convention was made between the United States and Great Britain for the protection of migratory birds in the United States and Canada. This was signed on August 16 and proclaimed December 8, 1916.

Article I of the treaty designates the migratory birds under three classifications, (1) migratory game birds, (2) migratory insectivorous birds, and (3) other migratory nongame birds, which are the auks, auklets, bitterns, fulmars, gannets, grebes, guillemots, gulls, herons, jaegers, loons, murres, petrels, puffins, shearwaters, and terns.

Article II prescribes close seasons for these three classes of birds. Section 3 refers particularly to those of the third category indicated above. It says:

> The close season on other migratory nongame birds shall continue throughout the year, except that Eskimos and Indians may take at any season auks, auklets, guillemots, murres, and puffins, and their eggs, for food and their skins for clothing, but the birds and eggs so taken shall not be sold or offered for sale.

It thus appears that gulls and terns, which are said to consume large quantities of herring, can not be killed lawfully at any time.

THE COPPER RIVER FISHERY.

When the fishing season of 1917 opened, it was found that seven canning companies had made preparations to take salmon from the Copper River. It was also learned that there would be a large increase in the amount of fishing gear employed, all of which gave promise of intensive and perhaps exhaustive fishing of those waters. The activities in this locality in 1916 were sufficient to cause some apprehension that serious inroads into the continuing supply of salmon might be made, thus threatening the existence of a valuable fishery. Special inquiries were therefore made in order to ascertain the facts and real conditions of the fishery, that out of the knowledge thus obtained the needs of the salmon fishery of the region might be learned and measures adopted to bring about its greater protection. Accordingly James H. Lyman, assistant agent in the Alaska service, spent much of the summer of 1917 on the Copper River examining spawning grounds and observing the effect of increased operations upon the escapement of salmon. Dr. Charles H. Gilbert, of Stanford University, California, also made valuable observations in respect to the exhaustion of the fishery.

As a result of these investigations, conditions were brought to light which, in the judgment of all interested persons, required careful and serious consideration to insure the permanency of the fishery. That the Copper River was overfished was admitted by all.

It was shown that approximately 60,000 fathoms of gill nets were used in the Copper River fishery in 1917, as compared with approximately 30,000 fathoms in 1916. The greater part of this gear was operated in the waters of the delta, and the catch of salmon in that section was correspondingly increased over that of 1916. Considerably more gear was employed in Miles Lake in 1917 than in 1916, but in proportion to the total number of fathoms used the catch was much less than in 1916, thus showing conclusively the effect of extended operations about the delta. The Copper River fisheries produced 890,000 salmon of all species in 1917, as compared with 869,350 in 1916. Of the catch in 1917, 62 per cent was taken from the waters of the delta, while the remaining 38 per cent came from all sections of the river above the delta. Although the catch was slightly larger than in 1916, the run of salmon in the river was regarded as being less for the reason that an increase of 100 per cent in the amount of gear operated would, under ordinary circumstances, result in a proportionately larger catch.

The Indians of the Copper River Valley, as for a number of years past, again protested against the extensive fishing operations on the river by the canning companies, and complained that the run of salmon was so light that they could not secure a sufficient supply of fish for their summer needs, much less those of the winter. The sincerity of the Indians in thus picturing themselves as extremely destitute and reduced to the verge of starvation is open to question. It is not in evidence that they have fared worse than the Indians in many other localities who may be even less fortunately situated.

The general condition of the Copper River fisheries was not satisfactory, and the preponderance of evidence weighed against a continuance of unrestricted fishing in any of its waters. It was regarded as a problem of unusual importance and one that merited early attention. After due consideration of all phases of the matter a hearing was held at Seattle, Wash., December 14, 1917, to consider the advisability of limiting or prohibiting fishing in the waters of the Copper River. It was attended by representatives of all the canning companies operating in the Copper River district, and a general discussion of the entire subject ensued. Various plans were proposed and discussed, and much information of value was adduced. As a result of this hearing, an order was promulgated on December 29, 1917, restricting in several ways commercial fishing in the Copper River and the waters of its delta. This order became effective January 1, 1918. The order appears in full elsewhere in this document.

SALMON HATCHERIES.

EXTENT OF OPERATIONS.

In 1917 fish-cultural operations were carried on at six hatcheries in Alaska—two operated by the Government and four by private interests. At one of the private hatcheries, namely, Klawak, operations were continued only to the extent of releasing the young salmon

from eggs taken in the fall of 1916. Two substations were operated in conjunction with the Afognak hatchery, one at Seal Bay and the other at Uganik. The annual capacity of the above-indicated hatcheries is approximately 303,000,000 red-salmon eggs, of which the two Government stations can handle 150,000,000.

In 1916 the total take of red or sockeye salmon eggs in Alaska was 171,542,000. In the corresponding report of Alaska Fisheries and Fur Industries for 1916 this number was stated to be 171,566,000, which was in error because of an incorrect report made by one of the private hatcheries. The number of red or sockeye salmon liberated in Alaskan waters in the season of 1916–17 was 155,641,000, as compared with 142,964,140 in the previous season. The take of red-salmon eggs in 1917 aggregated 115,964,000, or 55,578,000 less than in 1916. This great decrease is due in part to the closure of the Karluk hatchery and the failure to take eggs at Klawak, but results principally from the smaller take of eggs at the Fortmann hatchery, where only 6,840,000 were taken, as compared with 62,580,000 in 1916. The take of eggs at the Yes Bay and Quadra hatcheries was slightly smaller than in 1916, while at Hetta it was somewhat larger. The take at Afognak was approximately three times as large as in 1916. Collections of humpback-salmon eggs were made at Uganik and Seal Bay, which were transferred to Afognak.

OPERATIONS OF ALASKA HATCHERIES IN 1917.

Stations.	Red or sockeye salmon eggs taken in 1916.	Red or sockeye salmon liberated in 1916–17.	Red or sockeye salmon eggs taken in 1917
Yes Bay	58,000,000	[a] 51,175,000	34,950,000
Afognak	17,044,000	[b] 21,116,000	[c] 53,036,000
Uganik	692,000		([d])
Seal Bay	4,678,000		[e] 2,712,000
Karluk	1,016,000		
Fortmann (Naha Stream)	62,580,000	57,405,000	[f] 6,840,000
Quadra	16,125,000	15,003,000	13,600,000
Hetta	[g] 3,247,000	3,120,000	4,826,000
Klawak	8,160,000	7,822,000	([h])
Total	171,542,000	155,641,000	115,964,000

[a] 2,000,000 eyed eggs were transferred to the Oregon Fish Commission at Bonneville in October, 1916.
[b] Includes young salmon resulting from eggs received from Uganik, Seal Bay, and Karluk.
[c] 300,000 humpback-salmon eggs were also taken.
[d] 1,253,000 humpback-salmon eggs were taken.
[e] 2,560,000 humpback-salmon eggs were also taken.
[f] 2,400,000 humpback-salmon eggs were also taken.
[g] Incorrectly reported previously by the company as 3,271,000, which figures appeared in the Alaska Fisheries Report for 1916.
[h] No eggs were taken at Klawak in 1917.

NOTE.—Of the collections of red-salmon eggs at Afognak, shipments were made in November, 1917, as follows: Dominion Fisheries Department, Agassiz, British Columbia, 10,000,000; Bureau of Fisheries station, Quinault, Wash., 5,000,000, and Oregon Fish Commission, Bonneville, 3,000,000.

HATCHERY REBATES.

Under the Federal law operators of private hatcheries in Alaska are entitled to a rebate of 40 cents for every thousand red or king salmon fry released. This is the equivalent of the license tax imposed by the Government on 10 cases of canned salmon. It has been recommended from time to time to Congress that steps be taken to discontinue this system and that in lieu thereof all hatcheries in Alaska be operated by the Government. Under the law, operators of private hatcheries

in Alaska are required to make affidavit of the number of salmon fry released in each fiscal year ended June 30. The following table sets forth the rebates due for the fiscal year ending June 30, 1917:

REBATES CREDITED TO PRIVATE SALMON HATCHERIES DURING THE FISCAL YEAR ENDED JUNE 30, 1917.[a]

Owners.	Location.	Red-salmon fry liberated.	Rebate due.
Alaska Packers Association	Naha Stream	57,405,000	$22,962.00
Northwestern Fisheries Co	Quadra Lake	15,003,000	6,001.20
Do	Hetta Lake	3,120,000	1,248.00
North Pacific Trading & Packing Co	Klawak Lake	7,822,000	3,128.80
Total		83,350,000	33,340.00

[a] In the case of hatcheries where the seasonal distribution of fry is not completed before July 1, the remaining fry are shown in the subsequent fiscal year's report.

HATCHERY INSPECTION.

Inspections in respect to the operations of private hatcheries in Alaska were conducted as usual by representatives of the Bureau. In a general way, operations were conducted along satisfactory lines. Additional facilities for rearing salmon fry are required at practically all of the hatcheries in Alaska.

HATCHERY OPERATIONS.

YES BAY.

Between September 1 and October 2, 1916, at which latter date egg taking ceased at Yes Bay, a total of 58,000,000 red-salmon eggs were secured. In October of that year 2,000,000 eyed eggs were transferred to the station of the Oregon Fish Commission at Bonneville. Hatching was completed at Yes Bay on April 15, 1917. In the period from December 18, 1916, to August 3, 1917, there were 51,175,000 young salmon released. These plants consisted of 49,600,000 fry and 1,575,000 fingerlings. They were deposited in Yes River, Hatchery Creek, and Lake McDonald. The losses were: Eggs, 4,691,000; fry, 129,000; and fingerlings, 5,000; a total loss at Yes Bay of 4,825,000, or 8⅓ per cent. On account of inadequate facilities for holding fry to the free-swimming stage, many were liberated in the sac stage. Feeding on salt salmon began in June and continued until the supply was exhausted.

Egg taking in 1917 began on September 11 and ended September 26, during which period 34,950,000 red-salmon eggs were taken.

A patrol of Yes Bay was maintained as in seasons past to prevent commercial fishing in waters frequented by salmon headed for the hatchery stream.

AFOGNAK.

In 1916 the take of red-salmon eggs at Afognak was 17,044,000. This collection was augmented by the transfer of 681,000 eyed eggs from Uganik, 4,600,000 from Seal Bay, and 1,016,000 from Karluk. From this total of 23,341,000 there were planted in the period from October, 1916, to July, 1917 10,956,000 fry and 10,160,000 red-salmon fingerlings, a total of 21,116,000 young salmon. The loss of eggs and fry was 2,225,000, or approximately 9½ per cent.

In 1917 the red-salmon spawning season began on July 30 and ended September 11, in which period 53,036,000 red-salmon eggs were taken In November, 18,000,000 eyed red-salmon eggs were shipped from Afognak to Seattle, and thence distributed as follows: Dominion Fisheries Department, Agassiz, British Columbia, 10,000,000; Bureau of Fisheries station, Quinault, Wash., 5,000,000; and Oregon Fish Commission, Bonneville, 3,000,000.

In the period from September 1 to 8, 1917, there was a take of 300,000 humpback eggs at Afognak. This take was augmented by the humpback eggs transferred from the Seal Bay and the Uganik substations.

UGANIK.

At Uganik a substation of the Afognak hatchery was operated. In 1917 no red-salmon eggs were collected, but 1,253,000 humpback eggs were taken in the period from August 14 to September 16. The resulting eyed eggs were transferred to Afognak.

SEAL BAY.

Field station operations at Seal Bay were auxiliary to hatchery work at Afognak. In 1917 the taking of red-salmon eggs at Seal Bay began August 8 and ended August 29, a total of 2,712,000 being secured. These eggs were held until eyed and then planted September 14 and 17 in Little Seal Bay Creek.

Humpback eggs to the number of 2,560,000 were obtained between August 24 and September 14, 1917. On October 17 a plant of humpback eggs was made in the lake and stream at Seal Bay. The remaining humpback eggs resulting from the collection at this place were transferred to Afognak.

FORTMANN.

The Fortmann hatchery is operated on Heckman Lake, near Loring, Alaska, by the Alaska Packers Association. It is the largest hatchery in Alaska, having a capacity of approximately 110,000,000 red-salmon eggs. Operations in 1917 were the most unsatisfactory since the beginning of activities in 1901, only 6,840,000 red-salmon eggs being secured. It is reported that this small take was due in great measure to the excessive rainfall of more than 100 inches between July 1 and November 30, which made it almost impossible to obtain spawning fish. Egg-taking operations in 1917 extended from September 3 to October 20.

From the 62,580,000 red-salmon eggs taken in the period from August 22 to November 10, 1916, there were planted 57,405,000 fry. The loss was 5,175,000, or 8.27 per cent.

In 1917, from September 3 to October 9, a take of 2,400,000 humpback-salmon eggs was made for experimental purposes.

QUADRA.

This hatchery is located near Quadra, in southeastern Alaska, and is owned and operated by the Northwestern Fisheries Co. Its capacity is about 21,000,000 red-salmon eggs. In 1916 the taking of eggs began August 9 and ended November 19. The total take was 16,125,000. Between November 27, 1916, and June 30, 1917,

there were liberated 15,003,000 young red salmon. The loss was 1,122,000 eggs, or 6.9 per cent.

In 1917 the taking of red-salmon eggs began August 13 and ended November 3. The total take was 13,600,000.

HETTA.

This hatchery is also owned and operated by the Northwestern Fisheries Co. It is located on Hetta Lake, in southeastern Alaska. Its capacity is about 12,000,000 red-salmon eggs. In 1916 the take of red-salmon eggs between August 21 and December 21 was 3,247,000. The take of eggs in 1916 was erroneously reported by the company as 3,271,000, which figures were published in the corresponding report for 1916. In the period between August 21, 1916, and June 30, 1917, there were liberated 3,120,000 young red salmon. The loss was 127,000, or 3.9 per cent.

In 1917 the taking of red-salmon eggs began August 15 and ended December 14, during which period 4,826,000 were obtained.

KLAWAK.

The Klawak hatchery is operated by the North Pacific Trading & Packing Co., and is located on a lake a few miles above Klawak, in southeastern Alaska. Its capacity is approximately 10,000,000 red-salmon eggs. In 1916 the total take of eggs was 8,160,000, obtained in the period from July 20 to September 26. From these there were liberated 7,822,000 red-salmon fry between September 26, 1916, and February 16, 1917. The loss was, therefore, 338,000, or 4.14 per cent. This hatchery was not operated in the egg-collecting season of 1917, the company reporting that it was unable to find a competent man to take charge of operations.

GENERAL STATISTICS OF THE FISHERIES IN 1917.

The total investment in the Alaska fisheries in 1917 was $54,937,549, an increase of $15,367,937 over 1916. Approximately 88 per cent of this investment was in the salmon industry. The number of persons engaged in 1917 was 29,491, an increase of 5,497 over 1916. The total value of the products in 1917 was $51,466,980, an increase of $25,310,421 over 1916. This is an increase of more than 96 per cent in the value of the products of the Alaska fisheries. It was due in part to an increased pack of nearly all kinds of fish, but more especially to a tremendous advance in the market price of canned salmon, chums being 84 per cent higher per dozen 1-pound cans than in 1916; cohos, 64 per cent; pinks, 76 per cent; kings, 94 per cent; and reds, 56 per cent higher.

SUMMARY OF INVESTMENTS IN THE FISHERIES OF ALASKA IN 1917.

Industries.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Salmon canning	$19,929,055	$9,412,791	$17,523,425	$46,865,271
Salmon mild-curing	940,937			940,937
Salmon pickling	199,734	200,688	465,020	865,442
Salmon, fresh	81,579			81,579
Herring fishery	320,087	223,670	18,245	562,002
Halibut fishery	2,200,987			2,200,987
Cod fishery		516,536	891,729	1,408,265
Whale fishery	828,495	39,935	741,496	1,609,926
Clam canning		294,987		294,987
By-products	108,153			108,153
Total	24,609,027	10,688,607	19,639,915	54,937,549

SUMMARY OF PERSONS ENGAGED IN THE FISHERIES OF ALASKA IN 1917

Races.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Whites	7,491	2,768	5,781	16,043
Natives	4,281	993	896	6,170
Japanese	784	354	505	1,643
Chinese	1,075	497	702	2,274
Mexicans	347	146	1,054	1,547
Miscellaneous [a]	668	318	828	1,814
Total	14,649	5,076	9,766	29,491

[a] Filipinos, Negroes, Porto Ricans, etc.

SUMMARY OF PRODUCTS OF THE ALASKA FISHERIES IN 1917.

Products.	Quantity.	Value.	Products.	Quantity.	Value.
Salmon:					
Canned ....cases..	5,947,286	$46,304,090	Whale oil ....galls..	900,883	$438,362
Mild-cured ....lbs..	2,850,400	344,028	Sperm oil ....do....	197,670	149,270
Pickled ....bbls..	36,390	590,497	Whale fertilizer ....lbs..	1,980,600	61,720
Fresh ....lbs..	4,559,785	404,048	Whalebone ....do....	14,866	5,500
Frozen ....do....	1,282,182	81,574	Trout:		
Dry-salted, dried, and smoked ....lbs..	377,000	53,844	Frozen ....do....	7,798	701
Halibut:			Pickled ....do....	34,800	1,899
Fresh ....do....	7,038,283	605,205	Fresh ....do....	35,168	3,317
Frozen ....do....	6,115,128	515,021	Canned ....cases..	1,408	10,979
Cod ....do....	13,777,470	744,976	Sablefish ....lbs..	1,020,490	38,303
Herring:			Red rockfish ....do....	150,453	3,696
Canned ....cases..	49,245	326,522	Miscellaneous fresh fish, ...lbs..	114,167	2,247
Fresh and frozen for food ....lbs..	23,082	907	Clams ....cases..	74,515	274,036
Fresh and frozen for bait ....lbs..	6,089,780	57,556	Shrimps ....lbs..	65,000	3,400
Pickled for food..do....	4,593,025	248,299	Crabs ....doz..	410	665
Dry-salted for food, ...lbs..	165,000	11,349	By-products, oil.. ..galls..	25,150	19,560
Smoked for food..do....	21,600	700	By-products, fertilizer and meal ....lbs..	1,642,000	42,313
Oil ....galls..	205,992	82,396	Total	....	51,466,980
Fertilizer ....tons..	1,037	40,000			

SALMON INDUSTRY.

The salmon industry of Alaska in 1917 made tremendous gains over that of any previous season, exceeding all records in respect to the size and value of the pack. This increased production was due in part to the larger number of plants in operation, and also to the very heavy run of pink salmon in southeastern Alaska. That a material advance in value of products would result from the unusual demands of the times was not unexpected, but probably no one was prepared to witness such extraordinary increases in value of products, particularly canned salmon, as to almost double the high figures of 1916.

Southeastern Alaska contributed more than a million cases of salmon over its production of the preceding season, the increase consisting chiefly of humpbacks. The main body of salmon was later than usual in making its appearance, and some concern was felt among packers lest the season be a short one. These fears were dispelled, however, when a late but heavy run of humpback salmon entered Icy and Chatham Straits, thus enabling all canneries to make good packs, while in some instances records were broken. The number of canneries in this district was increased by nine, including two that formerly packed herring only.

The industry showed a gain of seven salmon canneries in central Alaska, several of which were located on Prince William Sound, but notwithstanding this increase in the number of plants the pack was less than in 1916, though of considerably greater value. The decline was due primarily to the comparatively small run of humpback salmon, although there was a falling off in the run of red salmon in the Cook Inlet district. Karluk and Alitak were again conspicuous in that they showed even better runs of red salmon than in 1916, which was then considered an exceptional year.

Western Alaska showed a pack of red salmon slightly larger than in 1916, even though there was a great falling off in the catch in the Port Moller region where five canneries were operated as against three in the preceding season. The entire pack of the five plants was less than that made at the Port Moller cannery alone in 1916. This is the only district in western Alaska where salmon are taken by purse seines, the chief fishing ground being off the mouth of Bear River. Opinions do not agree as to the ultimate destination of these salmon taken near Port Moller, since some observers hold that the run is local and destined to the Bear River lakes, while others maintain that it is a part of the run to Bristol Bay. No definite conclusion may be stated in respect to these opinions. It would seem, however, that the opinion that the run is local is probably correct, as at no other region between Unimak Island and the Ugashik River have salmon been obtained commercially, except in the Port Heiden field, where a few barrels have been pickled. If the salmon ordinarily taken in the Port Moller district are a part of the Bristol Bay fish deflected from their course by the currents of fresh water from the rivers near Port Moller, the small catch in that district may be easily explained by assuming that the main body of fish was not deflected in 1917 but held offshore and continued on its way toward the head of the bay. Perhaps also the almost incessant westerly winds prevailing during the time of the run may have influenced the movements of the salmon.

The catch of red salmon in western Alaska in 1917 was the largest that has ever been made, aggregating more than 24,000,000 fish and exceeding by 2,500,000 the highest previous figures, those of 1914.

SALMON CATCH AND FORMS OF GEAR.

As in previous years, gear used in the salmon fisheries of Alaska consisted chiefly of beach and purse seines, and gill and pound nets. There were 599 seines in operation, the total length of which was 98,520 fathoms. The gain in this form of apparatus over 1916 was 165, southeast Alaska being credited with an increase of 72, central Alaska with 84, and western Alaska with 9 additional seines.

Gill nets used in the salmon industry numbered 5,113 and measured in the aggregate 493,554 fathoms. They were divided among the three districts as follows: Southeast Alaska, 428 gill nets, a decrease from the number reported in 1916 of 132; central Alaska, 1,149, a gain of 644; and western Alaska, 3,536, an increase of 1,550. This is a net increase of 2,062 gill nets over 1916.

Two kinds of pound nets or traps were in use, floating and driven, there being 72 of the former and 398 of the latter, a total of 470. This is an increase of 97 over 1916. Of the number operated in 1917,

southeast Alaska had 72 floating and 243 driven, gains of 5 and 55, respectively; central Alaska had 136 driven pound nets, a gain of 42 over 1916, the increase being largely due to the operation of two new canneries in the western part of the district; and western Alaska had 19 driven pound nets as against 24 in 1916, a decrease of 5.

Taking Alaska as a whole, there was an increase of 31 per cent in the number of fathoms of seines operated in the salmon industry in 1916; the number of fathoms of gill nets employed increased 19 per cent; and pound nets increased 26 per cent in number.

Of the total catch of salmon in Alaska in 1917, 39 per cent was taken by pound nets, 32 per cent by seines, 28 per cent by gill nets, and 1 per cent by lines and dip nets. In 1916, seines caught 36 per cent of the salmon taken in Alaska, pound nets 33 per cent, gill nets 30 per cent, while other appliances caught the remaining 1 per cent. The catch by pound nets in 1917 increased 6 per cent, but the catch by seines and gill nets decreased 4 and 2 per cent, respectively. The following table shows the proportionate catch by districts according to the principal kinds of apparatus used:

PERCENTAGE OF SALMON CAUGHT IN EACH DISTRICT BY PRINCIPAL FORMS OF GEAR.

Apparatus.	Southeast Alaska.		Central Alaska.		Western Alaska.	
	1916	1917	1916	1917	1916	1917
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Seines	43	41	58	48	7	2
Pound nets	52	55	35	38	7	4
Gill nets	3	2	6	12	85	94

Alaska produced a total of 92,600,495 salmon in 1917 as against 72,055,971 in 1916, an increase of 20,544,524. There was an increase of 22,482,783 salmon in southeast Alaska and 1,605,605 in western Alaska, but central Alaska declined 4,306,439. Further comparison of the catch of Alaska as a whole with that of 1916 shows that chums increased 1,147,864, humpbacks 13,067,308, and reds 6,763,804. Cohos declined 350,078, and kings 84,674.

As of further interest in this connection, it may be stated that a total of 599 seines used in the salmon fisheries of Alaska took 29,381,979 salmon, an average of 49,052 per seine; a total of 470 pound nets used in the same fisheries caught 36,091,649 salmon, an average of 76,790 per pound net. The relative efficiency of the two forms of gear was at the ratio of 5 to 8 in favor of pound nets.

SALMON TAKEN IN 1917, BY SPECIES AND APPARATUS, FOR EACH GEOGRAPHIC SECTION OF ALASKA.

Apparatus and species.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Seines:	*Number.*	*Number.*	*Number.*	*Number.*
Coho, or silver	305,471	50,057	7,169	362,697
Chum, or keta	4,465,627	567,336	61,648	5,094,611
Humpback, or pink	16,506,787	2,561,677	612	19,069,076
King, or spring	6,461	1,562	6,705	14,728
Red, or sockeye	871,434	3,574,225	395,208	4,840,867
Total	22,155,780	6,754,857	471,342	29,381,979
Gill nets:				
Coho, or silver	321,860	229,836	73,733	625,429
Chum, or keta	108,376	77,587	336,708	522,671
Humpback, or pink	210,335	140,231	40,522	391,088
King, or spring	31,777	35,215	95,123	162,115
Red, or sockeye	535,912	1,251,376	22,822,194	24,609,482
Total	1,208,260	1,734,245	23,368,280	26,310,785
Pound nets:				
Coho, or silver	678,642	84,030	930	763,602
Chum, or keta	2,429,939	355,870	124,289	2,910,098
Humpback, or pink	25,190,370	209,964	560	25,400,894
King, or spring	36,757	37,489	14,576	88,822
Red, or sockeye	1,322,005	4,618,346	987,882	6,928,233
Total	29,657,713	5,305,699	1,128,237	36,091,649
Lines:				
Coho, or silver	343,758			343,758
Chum, or keta	198			198
Humpback, or pink	14,213			14,213
King, or spring	326,538			326,538
Red, or sockeye	41,475			41,475
Total	726,182			726,182
Dip nets:				
Coho, or silver		8,767		8,767
King, or spring		4,143		4,143
Red, or sockeye		76,990		76,990
Total		89,900		89,900
Total:				
Coho, or silver	1,649,731	372,690	81,832	2,104,253
Chum, or keta	7,004,140	1,000,793	522,645	8,527,578
Humpback, or pink	41,921,705	2,911,872	41,694	44,875,271
King, or spring	401,533	78,409	116,404	596,346
Red, or sockeye	2,770,826	9,520,937	24,205,284	36,497,047
Grand total	53,747,935	13,884,701	24,967,859	92,600,495

CATCH OF SALMON IN BRISTOL BAY WATERS.

Request has been received from commercial fishery interests for a compilation of the catch of salmon in the important Bristol Bay region of Alaska. Broadly speaking, about one-third of the yield of salmon from Alaskan waters comes from this region. The following table shows the catches made in the more important waters fished in the Bristol Bay district in the period of five years from 1913 to 1917.

SALMON IN THE COMMERCIAL CATCH, BRISTOL BAY REGION, 1913 TO 1917.

Species and stream.	1913	1914	1915	1916	1917	Total.
Red salmon:	*Number.*	*Number.*	*Number.*	*Number.*	*Number.*	*Number.*
Nushagak	5,236,008	6,174,097	5,676,457	3,592,574	5,679,818	26,358,954
Igushik	173,925	283,718	228,405	223,343	167,421	1,076,812
Kvichak-Naknek	13,691,050	12,584,809	7,156,488	11,551,086	15,762,582	60,746,015
Ugaguk	902,728	897,767	1,216,252	1,578,862	1,856,600	6,452,209
Ugashik	577,615	254,716	509,076	647,422	1,047,111	3,035,940
Total	20,581,326	20,195,107	14,786,678	17,593,287	24,513,532	97,669,930
King salmon:						
Nushagak	67,622	89,599	116,281	81,591	73,839	428,932
Igushik	34	94	106	330	477	1,041
Kvichak-Naknek	5,648	10,657	29,392	20,934	16,155	82,786
Ugaguk	254	405	510	365	143	1,677
Ugashik	691	1,209	1,739	1,904	531	6,074
Total	74,249	101,964	148,028	105,124	91,145	520,510
Coho salmon:						
Nushagak	66,640	81,434	117,172	293,210	62,260	620,716
Kvichak-Naknek	2	17,462	13,271	288	3	31,026
Ugaguk	165	165				330
Total	66,807	99,061	130,443	293,498	62,263	652,072
Pink and chum salmon:						
Nushagak	683,201	932,477	444,146	1,818,566	303,437	4,181,827
Igushik				738	183	921
Kvichak-Naknek	13,940	173,831	232,082	304,117	83,019	806,989
Ugaguk	7,450	7,450	12,004	7,500	5,726	40,130
Ugashik	14,704	14,613	18,212	49,196	879	97,604
Total	719,295	1,128,371	706,444	2,180,117	393,244	5,127,471
Grand total	21,441,677	21,524,503	15,771,593	20,172,026	25,060,184	103,969,983

SALMON CANNING.

NEW CANNERIES.

In 1917 there were 18 more salmon canneries in operation in Alaska than in 1916. Of this number nine were in southeast Alaska, seven in central, and two in western Alaska. Those in the southeastern district were operated as follows: Alaska Herring & Sardine Co., Port Walter; Alaska Pacific Herring Co., Big Port Walter; Baranof Packing Co., Red Bluff Bay; R. L. Cole & Co., Tokeen; Haines Packing Co., Letinkof Cove; Lane & Williams, Moira Sound; Northland Fish Co. (floating plant), Metlakatla; Sitka Packing Co., Sitka; and Robert Scott, a floating cannery at Craig. The central district shows the following: Copper River Packing Co., Port Nellie Juan; Lighthouse Canning Co., Cordova; Moore Packing Co., Cordova; Northwestern Fisheries Co., Kenai; Pacific American Fisheries, Ikatan; San Juan Fishing & Packing Co., Seward; Sockeye Salmon Co., Morzhovoi Bay; and Valdez Packing Co., Valdez. Those in western Alaska were the Fidalgo Island Packing Co. and the Phoenix Packing Co., both at Herendeen Bay.

Included in the above list are three canneries that operated in 1916, but were not then engaged in salmon canning, namely, those of the Alaska Herring & Sardine Co., the Alaska Pacific Herring Co., and the Lighthouse Canning Co.

CHANGES IN CANNERIES.

In December, 1916, the Lindenberger Packing Co. relinquished its cannery interests in Alaska by selling the Roe Point plant to the Northwestern Fisheries Co. and transferring the Craig plant to the Columbia Salmon Co., which latter concern also sold its cannery at Seldovia to the Northwestern Fisheries Co. It is reported that the Seattle Packing Co. retired from the fishery business in Alaska by the sale of the barge *Amelia*, used as a cannery in 1916, to the Northland Fish Co., which operated it at Metlakatla. The Sanitary Packing Co. became the Ketchikan Packing Co., which continued the operation of the plant at Ketchikan. In the fall of 1916 the Sunny Point Packing Co. took over all the interests of the Northland Packing Co., and operated the cannery also located at Ketchikan. The Canoe Pass Packing Co. built a cannery at Sugar Point, near Cordova, and moved thereto the machinery previously used in the leased quarters on the Cordova dock.

The canneries formerly listed in the name of the Alaska Fishermen's Packing Co., North Alaska Salmon Co., and the Yakutat & Southern Railway Co. are now shown under the name of Libby, McNeill & Libby.

CANNERIES OPERATED IN 1917.

In 1917 there were 118 salmon canneries in operation in Alaska 62 of which were in southeast Alaska, 27 in central Alaska, and 29 in western Alaska.

COMPANIES CANNING SALMON IN ALASKA, NUMBER AND LOCATION OF CANNERIES OPERATED, AND NUMBER OF POUND NETS OWNED BY EACH.

Name.	Canneries.	Location.	Pound nets.
Southeast Alaska:			
Alaska Fish Co.	1	Waterfall	2
Alaska Herring & Sardine Co.	1	Port Walter	[a]1
Alaska Pacific Fisheries	3	Chilkoot	[b]12
		Chomly	[c]9
		Yes Bay	[d]13
Alaska Pacific Herring Co.	1	Big Port Walter	......
Alaska Packers Association	2	Loring	[e]11
		Wrangell	[f]7
Alaska Sanitary Packing Co.	1	......do	5
Anacortes Fisheries Co.	2	Kasaan	7
		Shakan	3
Astoria & Puget Sound Canning Co.	1	Excursion Inlet	8
Auk Bay Salmon Canning Co.	1	Auk Bay	4
Baranof Packing Co.	1	Red Bluff Bay	......
Barnes, F. C., Co.	1	Lake Bay	3
Beegle Packing Co.	1	Ketchikan	3
Cole, R. L., & Co.	1	Tokeen	......
Columbia Salmon Co.	1	Craig	4
Deep Sea Salmon Co.	1	Ford Arm	[a]10
Doyhof Fish Products Co.	1	Scow Bay	[a]2
Fidalgo Island Packing Co.	1	Ketchikan	7
George Inlet Packing Co.	1	George Inlet	1½
Haines Packing Co.	1	Letinkof Cove	......
Harris, P. E., & Co.	1	Hawk Inlet	12
Hidden Inlet Canning Co.	1	Hidden Inlet	[g]2
Hoonah Packing Co.	2	Gambier Bay	5
		Hoonah	13
Hume, G. W., Co.	1	Nakat Harbor	[g]1
Karheen Packing Co.	1	Karheen	5
Ketchikan Packing Co.	1	Ketchikan	......
Lane & Williams	1	Moira Sound	......
Libby, McNeill & Libby	1	Yakutat	......
Myers, Geo. T., & Co.	1	Chatham	7
Northland Fish Co.	1	Metlakatla	2

[a] All floating. [b] 2 floating. [c] 4 floating. [d] 9 floating. [e] 6 floating. [f] 5 floating. [g] 1 floating.

Companies Canning Salmon in Alaska, Number and Location of Canneries Operated, and Number of Pound Nets Owned by Each—Contd.

Name.	Canneries.	Location.	Pound nets.
Southeast Alaska—Continued.			
North Pacific Trading & Packing Co.	1	Klawak	
Northwestern Fisheries Co.	5	Dundas Bay	[a]9
		Hunter Bay	[b]2
		Quadra	4
		Roe Point	[c]7
		Santa Ana	[b]1
Pacific American Fisheries	1	Excursion Inlet	18
Petersburg Packing Co.	1	Petersburg	3
Pillar Bay Packing Co.	1	Pillar Bay	4
Point Warde Packing Co.	1	Point Warde	
Pure Food Fish Co.	1	Ketchikan	[d]4
Sanborn-Cram Co.	1	Burnett Inlet	[b]4
Sanborn-Cutting Co.	1	Kake	[b]6
Scott, Robert	1	Craig	
Sitka Packing Co.	1	Sitka	
Smiley, J. L., & Co.	1	Ketchikan	3
Starr-Collinson Packing Co.	1	Moira Sound	[e]6
Straits Packing Co.	1	Skowl Arm	½
Sunny Point Packing Co.	2	Ketchikan	[d]5
		Sunny Point	
Swift-Arthur-Crosby Co.	1	Heceta Island	
Taku Canning & Cold Storage Co.	1	Taku Harbor	15
Tee Harbor Packing Co.	1	Tee Harbor	9
Tenakee Fisheries Co.	1	Tenakee	4
Thlinket Packing Co.	1	Funter Bay	23
Union Bay Fisheries Co.	1	Union Bay	3
Ward's Cove Packing Co.	1	Ward Cove	1
Wiese Packing Co.	1	Rose Inlet	3
Central Alaska:			
Alaska Packers Association	4	Alitak	2
		Chignik	3
		Kasilof	14
		Larsen Bay	
Canoe Pass Packing Co.	1	Cordova	3
Carlisle Packing Co.	1	do	3
Clark-Graham Co.	1	Eyak River	
Columbia River Packers' Association	1	Chignik	6
Copper River Packing Co.	2	Abercrombie	
		Port Nellie Juan	
Deep Sea Salmon Co.	1	Knik Arm	6
Fidalgo Island Packing Co.	1	Port Graham	6
Hoonah Packing Co.	1	Katalla	
Kadiak Fisheries Co.	1	Kodiak	1
Libby, McNeill & Libby	1	Kenai	16
Lighthouse Canning Co.	1	Cordova	
Moore Packing Co.	1	do	
Northwestern Fisheries Co.	5	Chignik	3
		Kenai	14
		Orca	
		Seldovia	6
		Uyak	
Pacific American Fisheries	2	Ikatan	13
		King Cove	12
San Juan Fishing & Packing Co.	1	Seward	
Sockeye Salmon Co.	1	Morzhovoi Bay	4
Valdez Packing Co.	1	Valdez	1
Western Alaska:			
Alaska Packers Association	8	Kvichak River (2)	
		Naknek River (3)	
		Nushagak Bay (2)	4
		Ugaguk River	
Alaska-Portland Packers' Association	1	Nushagak Bay	3
Alaska Salmon Co.	1	Wood River	
Bering Sea Packing Co.	1	Herendeen Bay	1
Bristol Bay Packing Co.	1	Kvichak Bay	
Columbia River Packers' Association	1	Nushagak Bay	
Fidalgo Island Packing Co.	1	Herendeen Bay	
Libby, McNeill & Libby	6	Nushagak Bay (2)	
		Koggiung	
		Kvichak River (2)	
		Ugaguk River	
Midnight Sun Packing Co.	1	Kotzebue	1
Naknek Packing Co.	1	Naknek River	
Nelson Lagoon Packing Co.	1	Nelson Lagoon	5
Northwestern Fisheries Co.	1	Nushagak	
Pacific American Fisheries	2	Makushin Bay	
		Port Moller	5
Phoenix Packing Co.	1	Herendeen Bay	
Red Salmon Canning Co.	2	Naknek	
		Ugashik River	

[a] 3 floating.
[b] All floating.
[c] 2 floating.
[d] 1 floating.
[e] 5 floating.

STATISTICS.

The number of canneries in operation in Alaska in 1917 was 118, as compared with 100 in 1916. The total investment was $46,865,271, an increase of $12,764,418 over 1916. The investment in southeast Alaska increased $7,198,635, in central Alaska $3,086,762, and in western Alaska $2,479,003.

The number of persons employed in the salmon-canning industry in 1917 was 23,350, an increase of 4,110 over 1916, when 19,240 were employed. Whites increased 2,823 and natives 767. Chinese decreased 97, Japanese 183, and miscellaneous 735. The decrease in miscellaneous persons employed is due to the fact that the Mexicans, which formerly were included in that category, are given separate classification in the list for 1917.

There were packed in Alaska in 1917 a total of 5,947,286 cases of salmon, valued at $46,295,900. This is an increase of 1,046,559 over the 4,900,627 cases packed in 1916 and an increase of $23,034,661 over the value of the 1916 pack, which was $23,269,429. The pack in 1917 establishes a new record in the production of the salmon fisheries, exceeding by long odds the pack of previous years in both quantity and value. Taking each section separately, the pack was as follows: Southeast Alaska advanced from 2,214,280 cases to 3,294,851, an increase of 1,080,571 cases; central Alaska declined from 1,075,913 to 1,017,206 cases, a falling off of 58,707 cases; and western Alaska increased from 1,610,434 to 1,635,235 cases, a gain of 24,801 cases over the pack of 1916. A comparison by species shows that chums increased from 724,115 to 906,747 cases, a gain of 182,632 cases; humpbacks increased from 1,737,793 to 2,296,976 cases, a gain of 559,183 cases; and reds increased from 2,110,937 to 2,488,381 cases, an advance of 377,444 cases. Cohos declined from 261,909 to 193,231 cases, a decrease of 68,678 cases, and kings fell off from 65,873 to 61,951 cases, a decrease of 3,922 cases in 1917.

INVESTMENT IN THE SALMON-CANNING INDUSTRY IN 1917.

Items.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	No.	Value.	No.	Value.	No.	Value.	No.	Value.
Canneries operated	62	$4,909,505	27	$2,081,865	29	$3,770,307	118	$10,761,677
Working capital		8,472,101		3,678,865		7,079,605		19,230,571
Wages paid		3,500,302		1,721,572		3,188,316		8,410,190
Vessels:								
Power vessels over 5 tons	232	1,202,346	72	622,716	74	1,051,140	378	2,876,202
Net tonnage	4,173		2,103		5,026		11,302	
Launches under 5 tons	106	83,428	135	120,705	33	113,698	274	317,831
Sailing	4	68,100	9	328,500	31	1,022,800	44	1,419,400
Net tonnage	4,331		14,603		45,735		64,679	
Boats, sail and row	1,102	68,818	657	50,527	1,348	291,664	3,107	411,009
Lighters, scows, and house-boats	338	186,068	204	124,906	180	228,163	722	539,137
Pile drivers	50	184,502	42	128,380	26	335,920	118	648,802
Apparatus:								
Haul seines	79	28,020	129	43,698	14	7,790	222	79,508
Fathoms	12,185		19,481		1,955		33,621	
Purse seines	278	157,399	10	8,970	30	60,021	318	226,390
Fathoms	49,949		1,725		7,620		59,294	
Gill nets	391	45,430	1,055	127,623	2,417	311,263	3,863	484,316
Fathoms	58,473		89,066		324,585		472,124	
Pound nets, driven	240	854,551	128	374,289	19	62,738	387	1,291,578
Pound nets, floating	72	168,485					72	168,485
Dip nets			70	175			70	175
Total		19,929,055		9,412,791		17,523,425		46,865,271

PERSONS ENGAGED IN THE SALMON-CANNING INDUSTRY IN 1917.

Occupations and races.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Fishermen:				
Whites	1,334	1,139	3,079	5,552
Natives	1,348	286	227	1,861
Chinese	...	...	1	1
Japanese	1	...	...	1
Mexicans	39	3	...	42
Miscellaneous [a]	18	5	...	23
Total	2,740	1,433	3,307	7,480
Shoresmen:				
Whites	2,358	788	1,687	4,833
Natives	1,832	604	525	2,961
Chinese	1,075	497	701	2,273
Japanese	740	343	498	1,581
Mexicans	308	143	1,042	1,493
Miscellaneous [a]	649	312	828	1,789
Total	6,962	2,687	5,281	14,930
Transporters:				
Whites	418	252	227	897
Natives	6	19	1	26
Japanese	8	7	...	15
Miscellaneous [a]	1	1	...	2
Total	433	279	228	940
Grand total:				
Whites	4,110	2,179	4,993	11,282
Natives	3,186	909	753	4,848
Chinese	1,075	497	702	2,274
Japanese	749	350	498	1,597
Mexicans	347	146	1,042	1,535
Miscellaneous [a]	668	318	828	1,814
Total	10,135	4,399	8,816	23,350

[a] Filipinos, Negroes, Porto Ricans, etc.

OUTPUT OF CANNED SALMON IN 1917.[a]

Product.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	Cases.	*Value.*	*Cases.*	*Value.*	*Cases.*	*Value.*	*Cases.*	*Value.*
Coho, or silver:								
½-pound flat	26,684	$286,435	3,728	$41,116	...	...	30,412	$327,551
1-pound flat	175	1,379	187	1,495	...	...	362	2,874
1-pound tall	125,009	1,040,945	32,007	265,981	5,441	$45,394	162,457	1,352,320
Total	151,868	1,328,759	35,922	308,592	5,441	45,394	193,231	1,682,745
Chum, or keta:								
½-pound flat	26,760	200,764	...	...	...	...	26,760	200,764
1-pound flat	1,625	10,209	905	5,430	...	...	2,530	15,639
1-pound tall	736,517	4,462,061	89,721	558,172	51,219	335,411	877,457	5,355,644
Total	764,902	4,673,034	90,626	563,602	51,219	335,411	906,747	5,572,047
Humpback, or pink:								
½-pound flat	90,273	761,078	1,130	9,610	...	...	91,403	770,688
1-pound flat	2,193	14,238	3,821	23,694	...	...	6,014	37,932
1-pound tall	2,057,104	13,139,455	140,334	833,225	2,121	12,762	2,199,559	13,985,442
Total	2,149,570	13,914,771	145,285	866,529	2,121	12,762	2,296,976	14,794,062
King, or spring:								
½-pound flat	10,423	121,525	321	3,843	2,229	29,870	12,973	155,238
1-pound flat	1,170	13,259	3,864	37,806	99	890	5,133	51,955
1-pound tall	12,117	147,896	15,102	139,254	16,626	150,104	43,845	437,254
Total	23,710	282,680	19,287	180,903	18,954	180,864	61,951	644,447
Red, or sockeye:								
½-pound flat	56,970	747,180	42,719	541,943	24,620	324,217	124,309	1,613,340
1-pound flat	23,236	254,573	35,432	383,100	30,944	307,613	89,612	945,286
1-pound tall	124,589	1,135,038	647,935	6,025,063	1,501,936	13,892,062	2,274,460	21,052,163
Total	204,795	2,136,791	726,086	6,950,106	1,557,500	14,523,892	2,488,381	23,610,789
Grand total	3,294,845	22,336,035	1,017,206	8,869,732	1,635,235	15,098,323	5,947,286	46,304,090

[a] Cases containing ½-pound cans have been reduced one-half in number, and thus, for the purpose of affording fair comparison, all are put upon the basis of forty-eight 1-pound cans per case.

OUTPUT OF CANNED SALMON, 1911 TO 1917.[a]

Product.	1911	1912	1913	1914	1915	1916	1917	Total.
Coho, or silver:	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*
½-pound flat	1,574	2,719	3,587	4,579	2,050	13,145	30,412	58,066
1-pound flat	1,075	17	266	285	2,338	8,191	362	13,534
1-pound tall	131,259	163,462	71,926	152,199	119,880	240,573	162,457	1,041,756
Total	133,908	166,198	75,779	157,063	124,268	261,909	193,231	1,112,356
Chum, or keta:								
½-pound flat	....	2,795	985	373	....	1,423	26,760	32,336
1-pound flat	7,245	....	2,619	5,568	317	....	2,530	18,279
1-pound tall	316,550	661,838	287,314	657,918	479,629	722,692	877,457	4,003,398
Total	323,795	664,633	290,918	663,859	479,946	724,115	906,747	4,054,013
Humpback, or pink:								
½-pound flat	4,836	13,712	20,822	2,103	4,325	41,491	91,403	178,692
1-pound flat	9,437	....	3,258	9,286	3,508	14,796	6,014	46,299
1-pound tall	991,005	1,266,426	1,348,801	974,660	1,867,683	1,681,506	2,199,559	10,329,640
Total	1,005,278	1,280,138	1,372,881	986,049	1,875,516	1,737,793	2,296,976	10,554,631
King, or spring:								
½-pound flat	67	5,151	1,585	3,143	2,404	2,617	12,973	27,940
1-pound flat	....	....	....	4,804	3,755	3,804	5,133	17,496
1-pound tall	45,451	38,166	32,785	40,092	82,092	59,452	43,845	341,883
Total	45,518	43,317	34,370	48,039	88,251	65,873	61,951	387,319
Red, or sockeye:								
½-pound flat	13,601	28,024	29,041	53,825	52,033	81,565	124,309	382,398
1-pound flat	4,967	16,242	11,735	64,671	112,847	86,395	89,612	386,469
1-pound tall	1,296,750	1,856,089	1,924,461	2,083,147	1,765,139	1,936,971	2,274,460	13,137,017
1½-pound nominals	....	....	....	....	2,293	....	....	2,293
2-pound nominals	....	....	....	....	....	6,006	....	6,006
Total	1,315,318	1,900,355	1,965,237	2,201,643	1,932,312	2,110,937	2,488,381	13,914,183
Grand total	2,823,817	4,054,641	3,739,185	4,056,653	4,500,293	4,900,627	5,947,286	30,022,502

[a] The number of cases shown has been put upon the common basis of forty-eight 1-pound cans per case.

AVERAGE ANNUAL PRICE PER CASE OF FORTY-EIGHT 1-POUND CANS OF SALMON, 1907 TO 1917.

Product.	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917
Coho, or silver	$3.91	$3.98	$4.07	$4.89	$5.67	$4.44	$3.45	$4.39	$4.31	$5.34	$8.76
Chum, or keta	2.97	2.53	2.28	3.04	3.72	2.37	2.21	3.37	2.59	3.34	6.14
Humpback, or pink	3.16	2.69	2.40	3.15	3.94	2.55	2.58	3.50	2.78	3.64	6.44
King, or spring	4.18	4.20	4.32	5.34	6.48	5.37	4.04	5.01	4.63	5.36	10.40
Red, or sockeye	4.59	4.52	4.53	5.30	6.33	5.45	4.54	5.58	5.82	6.04	9.48

LOSSES AND DISASTERS IN THE SALMON-CANNING INDUSTRY.

Two canneries were destroyed by fire during the season of 1917. The first of these was that of the Sunny Point Packing Co., at Sunny Point, on September 13. It resulted in the complete destruction of the plant, except floating equipment and 26,115 cases of canned salmon. The value of the property thus lost was $214,000. The second fire occurred on the night of October 2, when the cannery of the Astoria & Puget Sound Canning Co., at Excursion Inlet, was burned, together with 38,938 cases of salmon. Property valued at $315,613 was destroyed by this fire. The Anacortes Fisheries Co. sustained a loss of property at its Kasaan plant valued at $19,530, including buildings, fishing gear, machinery, and supplies. In southeast Alaska other losses of fishing gear and equipment reached a valuation of $18,629.

The companies operating in central Alaska were fortunate in that only minor losses of equipment and gear, valued at $3,607, were sustained.

The losses in western Alaska consisted chiefly of vessels. The Alaska Salmon Co. lost the steamer *Thistle*, valued at $10,000, when it struck a rock in British Columbia while northbound to engage in the season's operations. The Bristol Bay Packing Co. lost the launches *Corinne* and *Grace*, valued at $9,500. On May 14, the ship *Standard* (1,461 tons net), belonging to Libby, McNeill & Libby, went on a shoal near Cape Constantine and was lost with her cargo, the total value of both being $97,000. The same company lost the ship *St. Francis* (1,757 tons net), when it went on the rocks in Unimak Pass on May 14. It was valued at $30,879. On May 9, the bark *St. Katherine*, owned by the Red Salmon Canning Co., was stranded at King Salmon Point, Ugashik River, while loaded with a cargo of cannery supplies for the season's operations. Cargo valued at $65,000 was lost. New supplies were immediately rushed to the cannery from San Francisco by steamer, and reached there just before the salmon started to run. The *St. Katherine* was refloated by the aid of divers, pumps, and assistance rendered by the steamers *Lehua* and *Kadiak*, and was towed in ballast to San Francisco, where repairs were made. The cost of floating the vessel, towing charges, and repairs, was estimated at $75,000. Fishing gear and miscellaneous equipment to the value of $25,691 was also lost in western Alaska.

Considering Alaska as a whole, the value of property lost in the salmon-canning industry in 1917 was $884,249. The loss of life was greater than usual, 26 men having been drowned or otherwise accidentally killed.

MILD CURING OF SALMON.

The production of mild-cured salmon in Alaska in 1917 aggregated 3,563 tierces as against 4,898 in 1916. This decline of about 30 per cent was due not only to the fact that there was a smaller catch of king salmon, but for the reason that a larger number of kings were used for canning than in the preceding season. But little, if any, of this product was exported to European countries, in former years its chief market.

Southeast Alaska continues to produce the bulk of mild-cured salmon, although approximately 100 tierces were packed in central Alaska. No mild-cured salmon were reported in the western district.

A total of 23 operators engaged in the mild-cure industry in southeast Alaska, prominent among whom were the Alaska Herring & Sardine Co., Port Walter; Jakobsen & Hansen, Forrester Island; Noyes Island Packing Co., Noyes Island; Pacific Mild-Cure Co., at Hoonah, Port Conclusion, Taku Harbor, Tyee and Waterfall; Vendsyssel Packing Co., at Tyee; and the Northland Trading & Packing Co., at Saginaw Bay and Port Alexander. In central Alaska, the Kachemak Canning Co., at Tyonic, put up practically the entire mild-cured product of the district. This was incidental to the herring operations of the company.

INVESTMENT IN THE SALMON MILD-CURING INDUSTRY OF SOUTHEAST ALASKA IN 1917.

Items.	No.	Value.	Items.	No.	Value.
Fixed plants	10	$116,671	Gear:		
Operating capital	....	325,313	Seines, purse	1	$225
Vessels:			Fathoms	25	....
Power vessels over 5 tons	23	85,128	Seines, beach	4	1,250
Net tonnage	354	....	Fathoms	440	....
Launches under 5 tons	1,364	329,700	Gill nets	28	10,950
Boats, sail and row	930	27,800	Fathoms	5,340	....
Lighters and scows	7	5,310	Pound nets, driven	2	15,000
Pile drivers	1	6,000	Troll lines	2,505	17,590
			Total	....	940,937

PERSONS ENGAGED IN THE SALMON MILD-CURING INDUSTRY OF SOUTHEAST ALASKA IN 1917.

Occupations and races.	No.	Occupations and races.	No.
Fishermen:		Transporters:	
Whites	1,933	Whites	64
Natives	1,000	Natives	2
Total	2,933	Total	66
Shoresmen:		Grand total	3,137
Whites	106		
Natives	32		
Total	138		

PRODUCTS OF THE SALMON MILD-CURING INDUSTRY IN 1917.

Species.	Tierces.	Pounds.	Value.
Southeast Alaska:			
King salmon	2,937	2,349,600	$301,560
Coho salmon	327	261,600	21,590
Chum salmon	91	72,800	4,015
Humpback salmon	97	77,600	3,840
Red salmon	5	4,000	200
Total	3,457	2,765,600	331,205
Central Alaska: King salmon	106	84,800	12,823
Grand total	3,563	2,850,400	344,028

SALMON PICKLING.

Salmon pickling in Alaska in 1917 was carried on to a considerably greater extent than in 1916. The industry shows material gains in the number of salteries and in the investment. The production of pickled salmon was also approximately 100 per cent greater than in 1916.

A total of 37 salteries were operated, of which the southeastern district had 13, the central district 11, while the western district is credited with 13. This is a gain of 11 for southeast Alaska and 6 for western Alaska. The number in the central district is unchanged. The increase for the entire territory was 17. Investments in 1917 were $862,399, as against $340,887 in 1916, a gain of $522,512. The number of persons employed increased from 277 in 1916 to 509 in 1917.

Western Alaska continues to lead in the production of pickled salmon, the bulk of the yield of reds coming from that district.

Among the large operators may be mentioned the Alaska Packers Association, Alaska Salmon Co., Libby, McNeill & Libby, Peter M. Nelson, and Olson Bros., all of whom are established in the Bristol Bay district.

In 1917 Alaska produced 36,390 barrels of pickled salmon, as against 17,734 barrels in 1916. The value of the pack was $590,497, an increase over 1916 of $377,830. According to these figures, the average value per barrel was $16.20.

INVESTMENT IN THE SALMON PICKLING INDUSTRY IN 1917.

Items.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	No.	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*
Salteries	13	$62,320	11	$69,514	13	$129,018	37	$260,852
Operating capital		85,462		71,154		247,664		404,280
Vessels:								
Power vessels over 5 tons	8	36,062	6	21,550	1	5,500	15	63,112
Net tonnage	111		92		10		213	
Launches under 5 tons	6	4,850	6	7,900	4	6,400	16	19,150
Sailing					4	47,000	4	47,000
Net tonnage					1,070		1,070	
Boats, sail and row	22	945	39	1,790	72	10,530	131	13,265
Lighters and scows	4	2,470	4	800	8	6,100	16	9,370
Gear:								
Haul seines	10	2,025	26	4,572	7	910	43	7,507
Fathoms	920		2,660		345		3,815	
Purse seines	3	2,990	1	1,500			4	4,490
Fathoms	365		250				615	
Gill nets	5	715	94	8,503	119	11,896	217	21,114
Fathoms	455		6,570		8,355		15,380	
Lines	3	5	15	405	2	2	20	412
Pound nets, driven			6	13,000			6	13,000
Pound nets, floating	1	1,890					1	1,890
Total		199,734		200,688		465,020		865,442

PERSONS ENGAGED IN THE SALMON PICKLING INDUSTRY IN 1917.

Occupations and races.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Fishermen:				
Whites	44	33	86	163
Natives		15	63	78
Mexicans			12	12
Total	44	48	161	253
Shoresmen:				
Whites	59	21	74	154
Natives		10	42	52
Total	59	31	116	206
Transporters:				
Whites	29	9	11	49
Natives		1		1
Total	29	10	11	50
Grand total	132	89	288	509

BARRELS [a] OF SALMON PICKLED IN 1917, BY SPECIES.

Product.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	No.	*Value.*	*No.*	*Value.*	*No.*	*Value.*	*No.*	*Value.*
Coho, or silver	1,387	$22,275	185	$3,230	226	$4,126	1,798	$29,631
Coho bellies	11	326					11	326
Chum, or keta	959	11,948	512	7,271	251	2,680	1,722	21,899
Chum bellies	15	300	42	630	16	432	73	1,362
Humpback, or pink	5,453	72,724	80	617	43	516	5,576	73,857
Humpback bellies	84	2,245	24	600	2	40	110	2,885
King, or spring	1	15	62	1,157	296	5,384	359	6,556
King bellies			7	150			7	150
Red, or sockeye	50	921	2,368	45,489	24,292	406,609	26,710	453,019
Red bellies			22	770	2	42	24	812
Total	7,960	110,754	3,302	59,914	25,128	419,829	36,390	590,497

[a] Barrels holding 200 pounds of fish.

SALMON FREEZING.

All plants equipped for the freezing of salmon are located at the more important fishing centers in southeast Alaska, except one which was built at Seward, in central Alaska, by the San Juan Fishing & Packing Co. Those in southeast Alaska are owned and located as follows: New England Fish Co. and Ketchikan Cold Storage Co., at Ketchikan; Booth Fisheries Co., at Sitka; Columbia & Northern Fishing & Packing Co., at Wrangell; Juneau Cold Storage Co., at Juneau; Taku Canning & Cold Storage Co., at Taku Harbor; and the Glacier Fish Co., at Petersburg and at Scow Bay, where the barge *Glory of the Seas* was used as a cold-storage plant.

The output of frozen salmon in 1917 was 1,282,182 pounds, valued at $81,574. This is an increase in production of 418,776 pounds and in value of $47,166 over the figures reported in 1916.

One trap, valued at $2,500, and owned by the Juneau Cold Storage Co., is credited to this branch of the industry.

SALMON FROZEN IN ALASKA IN 1917.

Species.	Pounds.	Value.
Coho salmon	415,174	$24,308
Chum salmon	302,816	14,769
Humpback salmon	226,253	9,086
King salmon	301,777	30,460
Red salmon	36,162	2,951
Total	1,282,182	81,574

FRESH-SALMON TRADE.

Customs records at Juneau show that 3,559,785 pounds of fresh salmon were shipped from Alaska in 1917 and that the value of this product was $304,048. This is an increase over the figures given for 1916, when the production was 1,480,515 pounds of salmon, valued at $118,316. The trade in fresh salmon fluctuates considerably as the demand for salmon in the other industries may be great or small. With the high prices paid for salmon at the canneries and freezing plants, few operators found markets sufficiently attractive

to justify the additional cost of preparing their fish fresh for shipment. Those who made large shipments of fresh salmon from Alaska were H. Bergman, at Ketchikan; National Independent Fisheries Co., at Juneau; Pacific Mild-Cure Co., at Waterfall; C. M. Coulter, at Wrangell; Alaska Coast Fish Co., at Douglas; Glacier Fish Co., at Petersburg; and Lars Hansen, at Kake.

Several of these companies are engaged in the fresh-salmon trade only incidentally, as their major operations are along other lines. This business shows, however, some investment in plants, boats, and fishing apparatus; it also shows a considerable outlay in wages paid to those employed in it.

INVESTMENT IN THE FRESH-SALMON TRADE OF SOUTHEAST ALASKA IN 1917.

Items.	Number.	Value.	Items.	Number.	Value.
Plants		$8,670	Seines, beach (500 fathoms)	5	$1,441
Operating capital		31,500	Seines, purse (100 fathoms)	1	880
Wages paid		11,662	Gill nets (575 fathoms)	4	480
Launches	5	15,200	Pound nets, driven	3	11,500
Rowboats	6	119			
Scows	1	90	Total		81,542

A total of 37 persons were employed by the concerns, engaged principally in the marketing of fresh salmon. Statistics are not available to show the quantity of salmon that was used fresh locally, but it may be estimated as having been 1,000,000 pounds, having a value of $100,000. In view of the fact that fresh salmon are served throughout the season in all leading restaurants and hotels in Alaska and on all steamers plying along its coast, the above estimate may be too conservative. A large quantity of fresh salmon was also consumed at the various canneries and fisheries, which it would be desirable to include in order that the fisheries might receive full credit for what they produced.

DRY SALTING, DRYING, AND SMOKING OF SALMON.

In southeastern Alaska the Cross Sound Packing Co. of Alaska, at Gull Cove, dry salted 1,500 pounds of red salmon, valued at $120, and 53,100 pounds of humpback salmon, valued at $2,424. In central Alaska the Kenai Fishing & Packing Co., at Eshamy Bay, dry salted 100,000 pounds of red salmon, valued at $10,500. At Apokak, in western Alaska, the Kuskokwim Fishing & Transportation Co. dry salted 47,000 pounds of king salmon, valued at $4,700; 130,000 pounds of red salmon, valued at $11,700; and 40,000 pounds of coho salmon, valued at $3,600.

The only reported drying and smoking of salmon was done by the Beluga Whaling Co., at Three Mile Creek, Cook Inlet. About 1,400 pounds of beleke, valued at $350, and 4,000 pounds of red salmon, valued at $450, were prepared in this way and marketed in Alaska.

The Yukon River and its tributaries furnish large numbers of salmon which are dried and smoked for local use by the Indians and others, and as food for dogs. Accurate statistics of the number thus used are not at present available, but it is known that hundreds of tons of dried or smoked salmon are thus used. This source of food

is of vital importance and its continuance must be insured. Doubtless all of the large rivers that flow from the interior of Alaska contribute some salmon for the sustenance of the people who live along their banks, and were it possible to gather data showing the quantity so consumed the production of the fisheries would be considerably augmented.

Reports have been received for a total in 1917 of 377,000 pounds of salmon dry salted, dried, and smoked in Alaska, valued at $53,844.

SALMON BY-PRODUCTS.

The manufacture of oil and fertilizer from offal and waste material at the salmon canneries was engaged in by the Fish Canners By-Products Co. at Ward Cove, and the Pacific American Fisheries at Excursion Inlet. The North Pacific Trading & Packing Co. did not utilize any of the refuse from its cannery at Klawak in the preparation of by-products as formerly, and its plant was therefore not in operation.

The investment in this industry in 1917 was $108,153, as compared with $124,709 in 1916. Sixty-five men were employed in this work in 1917, which is 10 less than the number employed in 1916. The value of the products was $61,873, an increase of $13,948 over the output in 1916.

OUTPUT IN BY-PRODUCTS INDUSTRY IN ALASKA IN 1917.

Items.	Quantity.	Value.
Oil......gallons..	25,150	$19,560
Fertilizer......tons..	821	42,313
Total......	......	61,873

HALIBUT FISHERY.

The halibut fishery of Alaska comes next to the salmon fishery in quantity and value of product. The halibut fishery off the coast of Alaska is conducted chiefly upon seven fishing grounds, which, in the order of their location from east to west, are generally designated as follows: Noyes Island, Coronation Island, Cape Spencer, Yakutat, Yakataga, Cape Cleare, and Portlock Bank. All of these localities are visited by the larger vessels of the halibut fleet, the Yakutat grounds and Portlock Bank producing probably the bulk of the catch delivered at Puget Sound and British Columbia ports. The smaller vessels as a rule frequent the inshore grounds of southeast Alaska, and deliver their catches principally at Alaskan ports, although the larger of these boats often go to Prince Rupert.

As for several years past, vexing problems in connection with conflicting American and Canadian interests in the Pacific coast halibut fishery have continued to occur. Some American interests have felt that the trend of the halibut trade toward Prince Rupert has been caused by unwarranted activities that demanded and justified prompt and decisive action lest Canada profit greatly at the expense of this country. Upon the other hand, Canadian interests have no doubt felt that they were within their rights in taking advantage of trans-

continental railroad terminal facilities at Prince Rupert, nearer some of the important fishing grounds than other important railroad centers, to build up as large a trade as possible in the halibut industry.

STATISTICAL SUMMARY.

The investment in the halibut industry in Alaska was $2,200,987 in 1917 as compared with $2,149,311 in 1916, an increase of $51,676. The number of persons employed in this fishery declined from 1,116 in 1916 to 909 in 1917, the difference having been absorbed by the salmon industry and credited to it. The halibut fisheries produced a total of 13,153,411 pounds, valued at $1,120,226. This is an increase of 1,657,854 pounds over the production in 1916. In a comparison of the selling price of halibut by independent fishing vessels at the ports of Seattle, Prince Rupert, and Ketchikan, it appears that the average price per pound received by the fishermen throughout the year was 9½ cents at Ketchikan, 12½ cents at Prince Rupert, and 15½ cents at Seattle. The average price at Petersburg was probably not higher than 7½ or 8 cents per pound. The Ketchikan figures are based on prices paid in January, February, March, June, August, and September. Quotations for the other months are not reported, but it is improbable that the general average would be materially changed by their inclusion. Prices for the months named ranged from 12¼ cents in February to 7 cents in March.

Prices for Prince Rupert are for the entire year and are 33⅓ per cent higher than in Alaska. The highest price was 18¾ cents per pound in October, and the lowest 7 cents in March.

Seattle prices averaged 66⅔ per cent higher than those at Ketchikan. In 1917 halibut sold at 8 cents per pound in May and 30 cents in September.

The total catch of halibut on the Pacific coast was approximately 60,000,000 pounds, of which probably 30,000,000 pounds were taken from the grounds contiguous to the coast of Alaska. Available statistics show, however, that only a little more than 13,000,000 pounds was credited to Alaska. Undoubtedly a large part of the halibut delivered at Prince Rupert is also taken on these grounds, so that the estimate as above given is substantially correct.

Those chiefly engaged in the halibut industry in Alaska in 1917 were the Alaska Coast Fish Co., at Douglas; Booth Fisheries Co., at Sitka; Columbia & Northern Fishing & Packing Co., at Wrangell; Glacier Fish Co., at Petersburg and at Scow Bay, where the barge *Glory of the Seas* was used as a floating cold-storage plant; Juneau Cold Storage Co. and National Independent Fisheries Co., at Juneau; Taku Canning & Cold Storage Co., at Taku Harbor; New England Fish Co. and Washington Fish & Oyster Co., at Ketchikan; and the San Juan Fishing & Packing Co., at Seward. Buyers for the Ripley Fish Co. were located at Petersburg and Ketchikan.

The New England Fish Co. suffered the loss of the steamer *Manhattan* off Cape Spencer during a severe storm on November 15, 1917. This vessel (134 tons net) was valued at $125,000.

INVESTMENT IN THE ALASKA HALIBUT FISHERIES IN 1917.

Items.	Number.	Value.	Items.	Number.	Value.
Fishing vessels:			Dories and scows	299	$18,800
Steamer and gas	136	$954,090	Fishing apparatus		57,105
Tonnage	2,536		Shore and fixed property		265,100
Sailing	1	153,000			
Tonnage	2,247		Total		2,200,987
Launches	3	2,892			
Outfit		750,000			

PERSONS ENGAGED IN THE ALASKA HALIBUT FISHERIES IN 1917.

Races.	Number.
Whites	899
Natives	10
Total	909

PRODUCTS OF THE ALASKA HALIBUT FISHERY IN 1917.

Products.	Pounds.	Value.
Halibut:		
Fresh (including local)	7,038,283	$605,205
Frozen	6,115,128	515,021
Total	13,153,411	1,120,226

The following additional statistics of the Pacific halibut industry were submitted by E. J. Brown, local agent of the Bureau at Seattle, who, in January, 1918, visited the important halibut fishing centers of Alaska and British Columbia:

HALIBUT LANDINGS AT PRINCIPAL PORTS OF THE NORTH PACIFIC, 1912 TO 1917.

Ports.	1912	1913	1914	1915	1916	1917	Total.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Seattle	27,246,100	29,916,500	35,520,400	27,906,473	16,152,135	15,872,000	152,613,608
Ketchikan	6,806,003	8,744,850	6,305,175	5,226,840	4,107,311	4,008,000	35,198,179
Prince Rupert		7,320,755	8,742,100	18,722,877	19,278,395	18,140,000	72,204,127
Vancouver, British Columbia	16,550,000	8,833,500	6,868,500	8,986,000	6,853,000	5,162,000	53,253,000
Total	50,602,103	54,815,605	57,436,175	60,842,190	46,390,841	43,182,000	313,268,914

POUNDS OF HALIBUT LANDED BY OFFSHORE FISHING FLEET AT PRINCE RUPERT, BRITISH COLUMBIA, DURING YEAR 1917, SHOWING RECEIPTS BY VARIOUS FIRMS FROM INDEPENDENT AND COMPANY-OWNED VESSELS.

Months.	Canadian Fish & Cold Storage Co.		National Independent Fisheries (independent).	Royal Fish Co. (independent).	Pacific Fisheries Co. (independent).	Atlin Fisheries (Ltd.).	
	Independent.	Company.				Independent.	Company.
January	243,000	102,000			88,000	63,000	
February	328,000	57,000			34,000	70,000	
March	501,000	176,000			201,000	218,000	105,000
April	803,000	241,000	30,000		181,000	485,000	
May	1,178,000	531,000		69,000	86,500	535,500	20,000
June	860,000	468,000	29,000	128,000		402,000	
July	1,042,000	370,000		134,000	109,000	327,000	
August	744,000	280,000	31,000	60,000	50,000	298,000	
September	768,000	312,000		81,000		252,000	16,000
October	469,000	179,000		78,000		35,000	111,000
November	595,000	238,000		40,000		73,000	
December	187,000	272,000		2,000			
Total	7,718,000	3,226,000	90,000	592,000	749,500	2,758,500	252,000

Months.	Booth Fisheries Co.		Total.		Grand total.
	Independent.	Company.	Independent.	Company.	
January	44,000	42,000	438,000	144,000	582,000
February	8,000	35,000	440,000	92,000	532,000
March	206,000	30,000	1,126,000	311,000	1,437,000
April	271,000		1,770,000	241,000	2,011,000
May	380,000		2,249,000	551,000	2,800,000
June	357,000	55,000	1,776,000	523,000	2,299,000
July	422,000		2,034,000	370,000	2,404,000
August	286,000		1,469,000	280,000	1,749,000
September	253,000		1,354,000	328,000	1,682,000
October	153,000		735,000	290,000	1,025,000
November	102,000		810,000	238,000	1,048,000
December	110,000		299,000	272,000	571,000
Total	2,592,000	162,000	14,500,000	3,640,000	18,140,000

PURCHASES OF HERRING BAIT AT KETCHIKAN BY CANADIAN HALIBUT VESSELS IN 1917.

Date.	Name of vessel.	Pounds.	Date.	Name of vessel.	Pounds.
Jan. 3	Chief Seugaid [a]	10,000	Oct. 23	Grier Sterrett [a]	7,130
13	W. R. Lord [a]	4,000	25	Chief Zibassa [a]	8,020
30	Chief Zibassa [a]	12,305	Nov. 8	G. E. Foster [a]	10,340
Feb. 23	Chief Seugaid [a]	10,000	11	Andrew Kelly [a]	10,000
Mar. 7	Grier Sterrett [a]	6,000	14	James Carruthers [a]	10,000
July 15	Carlotte G. Cox	13,840	21	Chief Zibassa [a]	12,000
Oct. 6	Grier Sterrett [a]	7,200	16	Sitka [a]	10,000
8	King Salmon	1,500	30	D. C. F., No. 1	16,000
10	Chief Seugaid [a]	5,300	30	Sumner [a]	7,090
17	Margaliu	1,500	Dec. 1	G. E. Foster [a]	10,090
17	Andrew Kelly [a]	10,100	2	Andrew Kelly [a]	10,000
17	G. E. Foster [a]	10,035	5	James Carruthers [a]	10,080
21	Caygeon	1,500	15	Kings Way	10,000
22	Carlotte G. Cox	8,050	19	Sitka [a]	4,020
24	James Carruthers [a]	25,025			
23	Muiereag	2,310		Total	263,435

[a] Owned and operated by the Canadian Fish & Cold Storage Co.

COD FISHERY.

The quantity of cod produced in Alaska in 1917 was hardly equal to that of the preceding year, but in value it greatly exceeded the output of 1916. At times during the year the demand for Alaska cod was greater than the supply, and there was some fear that the catch would be extremely light, with a correspondingly serious effect upon the trade.

Ordinarily the demand for cod in the West Indies must be reckoned with in any distribution of the supply, but, fortunately perhaps, there was no call from that quarter until much later than usual, as some importations had been made from Nova Scotia and Labrador. The resulting surplus thus opened the way for the development of markets in South America. The Hawaiian Islands and Australia received a part of the cod products of Alaska.

VESSEL FISHERY.

The Northern Fisheries (Inc.), of Anacortes, is the only new concern to engage in the vessel cod fishery of Alaska in 1917. It operated the auxiliary schooner *Progress* (115 tons) in fishing off the Alaskan coast from the Shumagin Islands to the westward, and also as a transporting vessel for the station at Kodiak. The schooner *Fortuna* (138 tons), operated by the Pacific Coast Codfish Co. in 1916, did not go to Alaska in 1917. The Alaska Codfish Co. added one vessel, the schooner *S. N. Castle* (464 tons net), to its fleet.

ALASKA COD FLEET, 1917.

Names.	Rig.	Net tonnage.	Operators.
Azalea	Schooner	327	J. A. Matheson, Anacortes, Wash.
Fanny Dutard	do	252	Do.
Wawona	do	413	Robinson Fisheries Co., Anacortes, Wash.
Alice	do	220	Do.
John A	do	235	Pacific Coast Codfish Co., Seattle, Wash.
Charles R. Wilson	do	328	Do.
Maid of Orleans	do	171	Do.
Glendale	do	281	Alaska Codfish Co., San Francisco, Cal.
Allen A [a]	do	266	Do.
City of Papeete [a]	do	370	Do.
Maweema	do	392	Do.
S. N. Castle	do	464	Do.
Sequoia	do	324	Union Fish Co., San Francisco, Cal.
Vega	do	223	Do.
Galilee	do	328	Do.
Martha	do	14	Do.
Golden State [b]	Power schooner	233	Do.
Pirate	do	30	Do.
Union Flag	do	7	Do.
Progress [c]	do	115	Northern Fisheries (Inc.), Anacortes, Wash.
Hunter [d]	do	60	Do.
Valdez	do	10	Do.
Harold Blekum [e]	Schooner	192	Do.
Chas. Brown	do	64	Do.

[a] Transporting vessel for shore stations; also made one fishing voyage.
[b] Transporting vessel.
[c] Transporting vessel; also made two fishing voyages.
[d] Wrecked Aug. 30, 1917.
[e] Wrecked Mar. 3, 1917.

SHORE STATIONS.

Three companies, engaging in fishery business in southeast Alaska, are to be noted among the operators of cod shore stations incidental to their salmon and halibut operations. They are the New England Fish Co., at Ketchikan; Taku Canning & Cold Storage Co., at Taku Harbor; and Advance Fisheries Co., at Craig. The central district shows several additional operators. The following in this district handled cod, either as incidental to other lines or as their chief business: Columbia River Packers' Association, at Chignik; Kadiak Fisheries Co., and Northern Fisheries (Inc.), at Kodiak; Gus Ohm, at Cordova; San Juan Fishing & Packing Co., at Seward; W. J. Riegel, at Uyak Bay; Shumagin Packing Co. and John H. Nelson at Squaw Harbor; Pacific American Fisheries, at King Cove; Deep Sea Codfish Co., at Unga; N. H. Johnson, at Snug Harbor; North Pacific Sea Products Co., at Akutan; Alaska Codfish Co., at Kelleys Rock and Unga on Unga Island, Companys Harbor and Murphys Cove on Sannak Island, and Dora Harbor on Unimak Island; Union Fish Co., at Pirate Cove on Popof Island, Unga on Unga Island, Sanborn Harbor and Eagle Harbor on Nagai Island, Northwest Harbor on Herendeen Island, Pavlof Harbor and Johnson Harbor on Sannak Island, and Tigalda Lagoon on Tigalda Island; Akutan Codfish Co., at Akutan; Pacific American Fisheries at Makushin and Port Moller; and the Nelson Lagoon Packing Co., at Nelson Lagoon.

The Pacific American Fisheries and the Nelson Lagoon Packing Co. experimented further in the canning of cod by packing 2,070 cases of 1-pound flat cans and 567 cases of one-half-pound flat cans.

The Northern Fisheries (Inc.), lost two vessels during the year, the first being the schooner *Harold Blekum* (192 tons net), which was wrecked in Ugak Bay, Kodiak Island, on March 3, 1917. This vessel was valued at $15,000. The second loss occurred on August 30, when the auxiliary schooner *Hunter* (60 tons net), struck a rock off Sutwik Island and foundered immediately. This vessel was valued at $10,000, and was returning to Kodiak from a fishing voyage to western waters. Three fishermen were drowned and one was accidentally killed while engaged in this industry.

STATISTICAL SUMMARY.

The Alaska codfish industry shows an investment of $1,408,265, which is an increase of $844,053 over 1916. A total of 795 persons were employed, as compared with 778 in 1916.

This fishery produced a total of 13,777,470 pounds of cod, valued at $744,976. This is a decrease of 524,894 pounds in production, and an increase of $226,179 in value.

INVESTMENT IN THE COD FISHERY IN ALASKA IN 1917.

Items.	Number.	Value.	Items.	Number.	Value.
Value of shore stations		$126,843	Vessels—Continued:		
Operating capital		949,014	Boats, row	472	$18,265
Vessels:			Pile drivers	2	250
Power vessels over 5 tons	5	67,817	Apparatus: Hand lines	3,510	1,776
Net tonnage	388				
Launches under 5 tons	13	13,000	Total		1,408,265
Sailing vessels	17	231,300			
Net tonnage	4,682				

PERSONS ENGAGED IN THE ALASKA COD FISHERY IN 1917.

Occupations and races.	Number.	Occupations and races.	Number.
Fishermen:		Transporters: Whites	20
Whites	695	Grand total	795
Natives	36		
Total	731		
Shoresmen:			
Whites	40		
Natives	4		
Total	44		

PRODUCTS OF ALASKA COD FISHERY IN 1917.

Products.	Pounds.	Value.	Products.	Pounds.	Value.
Vessel catch:			Canned:		
Dry-salted cod	9,825,044	$541,230	In ½-pound flats (567 cases)	13,608	$2,338
Pickled cod	417,256	17,240	In 1-pound flats (2,070 cases)	99,360	12,420
Tongues	16,800	1,440	Total	112,968	14,758
Total	10,259,100	559,910			
Shore-station catch:			Total:		
Dry-salted cod	2,137,534	94,167	Dry-salted cod	11,962,578	635,397
Pickled cod	968,438	57,666	Pickled cod	1,385,694	74,906
Stockfish	69,200	12,400	Stockfish	69,200	12,400
Tongues	6,400	480	Tongues	23,200	1,920
Frozen	223,830	5,595	Frozen cod	223,830	5,595
Total	3,405,402	170,308	Canned	112,968	14,758
			Total	13,777,470	744,976

HERRING FISHERY.

By reason of the lessened importation of pickled herring from abroad, consequent upon the extraordinary demand for such products in other countries, American consumers could not be supplied to the full extent of their demands. In order to stimulate production, and to enable the packers to prepare a commodity acceptable to the general trade and thus in a measure offset the shortage of imported herring, the Government secured the services of Aug. H. D. Klie, a recognized expert in the preparation of herring by the Scotch cure. Early in May, 1917, he was sent to Alaska, which was regarded as the most promising field for exploitation and development, and was authorized to make such demonstration of the Scotch method and give such instruction to designated assistants as would enable them to aid and encourage herring packers in southeast and central Alaska, where operations were chiefly carried on.

Directions in printed form were mailed early in the season to all companies and individuals who were known to be interested in any phase of the Alaskan fisheries, and their cooperation was requested in making a determined effort to utilize a much neglected food fish, thus increasing food supplies and lightening the drain on other meat supplies so urgently needed abroad in the commissariat of the army of this and allied countries.

As special assistants to Mr. Klie, William P. Studdert, Clarence L. Anderson, and Donald R. Crawford were sent to Alaska, and

after acquiring a thorough practical working knowledge of the Scotch method of curing herring, a process previously unknown in Alaska, they proceeded to separate districts to render aid and give practical demonstrations and instructions to interested persons. Mr. Crawford was assigned to the southeastern district, Mr. Anderson to the Prince William Sound region, with headquarters at Cordova, and Mr. Studdert devoted most of his attention to the important Cook Inlet section, centering at Seldovia.

The efforts of the Government along this line were met in a commendable manner by two of the large companies interested in the fisheries of Alaska—the Alaska Herring & Sardine Co. and the Alaska Pacific Herring Co., both at Port Walter. These two companies packed several hundred barrels of Scotch-cured herring. Smaller operators manifested a willingness to follow the Scotch cure, and encouraging results were obtained. The greater part of the herring pickled in Alaska in 1917 was prepared, however, according to the Norwegian formula. This may be due to the fact that it requires less work to pack herring in this way. Moreover, no particular style of barrel is required, whereas the packing of herring by the Scotch cure involves more labor and care and requires a special barrel, but a better article and one that the trade demands is obtained. It was to meet the needs of the market and stimulate the production of a highly desirable aquatic food that the Government inaugurated the campaign to establish the Scotch-cure method of preparing herring in Alaska. As a direct result of this work, 1,877,450 pounds, or 7,622 barrels, of herring were Scotch cured in Alaska in 1917, as compared with nothing previously. At the same time 13,576 barrels were packed by the Norwegian method.

STATISTICAL SUMMARY.

In 1917 the investment in the herring fishery of Alaska was $562,002, as compared with $509,046 in 1916. This is a very creditable showing when viewed in connection with the fact that the investments of the Alaska Herring & Sardine Co. and the Alaska Pacific Herring Co. are now included in the investments in the salmon industry, since both companies made considerable packs of canned salmon. The number of persons engaged was 214, as compared with 392 in 1916. The products were valued at $767,729, as compared with $418,076 in 1916, the gain being $349,653.

INVESTMENT IN THE HERRING FISHERY OF ALASKA IN 1917.

Items.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	No.	Value.	No.	Value.	No.	Value.	No.	Value.
Plants operated	7	$100,700	5	$107,340	2	$5,800	14	$213,840
Operating capital		177,087		80,083		9,100		266,270
Vessels:								
Power vessels over 5 tons.	6	19,300	2	13,000	1	850	9	33,150
Net tonnage	176		38				214	
Launches under 5 tons	3	3,800	4	5,100	1	800	8	9,700
Boats, row and seine	18	2,350	32	2,830	4	375	54	5,555
Lighters and scows	6	4,750	9	7,912	1	250	16	12,912
Pile drivers	2	1,500	1	1,200			3	2,700
Gear:								
Seines	14	10,600	7	2,300	1	350	22	13,250
Fathoms	1,830		550		65		2,445	
Gill nets			96	3,905	32	720	128	4,625
Fathoms			4,990		430		5,420	
Total		320,087		223,670		18,245		562,002

PERSONS ENGAGED IN THE ALASKA HERRING FISHERY IN 1917.

Occupations and races.	Number.	Occupations and races.	Number.
Fishermen:		Shoresmen: Whites	27
Whites	98	Transporters: Whites	9
Natives	79	Grand total	214
Chinese	1		
Total	178		

PRODUCTS OF ALASKA HERRING FISHERY IN 1917.

Products.	Quantity.	Value.
Herring:		
Dry salted, for food...pounds	165,000	$11,349
Fresh, for food...do	6,000	480
Fresh, for bait...do	2,093,600	25,735
Frozen, for food...do	17,082	427
Frozen, for bait...do	3,996,180	31,821
Pickled, for food...barrels	[a] 21,198	248,299
Canned...cases	[b] 49,245	326,522
Smoked, for food...pounds	21,600	700
Oil...gallons	205,992	82,396
Fertilizer...tons	1,037	40,000
Total		767,729

[a] Includes 6,521 barrels, of 250 pounds, and 1,091 half barrels, of 125 pounds, of Scotch-cured herring.
[b] Includes 8,557 cases, of one-half-pound oval cans at 96 cans per case, and 7,370 cases, of one-half-pound ovals at 48 cans per case.

WHALE FISHERY.

SHORE STATIONS.

The United States Whaling Co., at Port Armstrong, and the North Pacific Sea Products Co., at Akutan, continued as the principal operators in the whaling industry. The Beluga Whaling Co., at Beluga River, was the only other concern to engage in whaling, but its activities were confined to the capture of belugas, or white whales, in Cook Inlet. In the past similar operations were carried on near Nome by Nygren & Torkensen, but there is no record that they operated in 1917.

The United States Whaling Co. operated the steamers *Star I* (133 tons), *Star II* and *Star III* (97 tons each), in whale killing as formerly. The North Pacific Sea Products Co., in addition to the steamers *Kodiak* and *Unimak* (99 tons each), and the *Tanginak* (71 tons), also operated the power schooner *Halcyon* (61 tons), as a whaling vessel, while the barge *Fresno* (1,149 tons) was again used as a transporting vessel.

STATISTICAL SUMMARY.

The investment in the whaling industry in Alaska in 1917 was $1,609,926, an increase of $518,455 over 1916. A total of 162 persons was employed as against 233 in 1916. The value of the product was $654,852, which is a gain of $291,131 over 1916. Shore-station operations resulted in the capture of 423 whales, which is 34 more than the take of the previous year.

WHALES TAKEN IN SHORE OPERATIONS IN 1917.

Species.	Number.	Species.	Number.
Bowhead	2	Beluga	9
Finback	153	Others	26
Humpback	44		
Sulphur-bottom	138	Total	423
Sperm	51		

INVESTMENT IN SHORE WHALE FISHERY IN ALASKA IN 1917.

Items.	Number.	Value.	Items.	Number.	Value.
Vessels:			Pile drivers	1	$100
Steamers	8	$292,500	Seines	14	6,000
Net tonnage	662		Guns	5	5,625
Barge	1	30,000	Value of plants		492,000
Net tonnage	1,149		Cash capital		644,300
Launches under 5 tons	4	4,900	Wages paid		132,141
Boats, row	4	260			
Scows	4	2,100	Total		1,609,926

PERSONS ENGAGED IN THE SHORE WHALE FISHERY IN ALASKA IN 1917.

Races.	Number.
Whites	188
Natives	30
Japanese	44
Total	262

PRODUCTS OF ALASKA SHORE WHALING OPERATIONS IN 1917.

Products.	Quantity.	Value.
Whale oil....gallons	900,883	$438,362
Sperm oil....do	197,670	149,270
Fertilizer, meat....pounds	1,668,000	47,380
Fertilizer, bone....do	312,600	14,340
Whalebone....do	14,866	5,500
Total		654,852

CLAM FISHERY.

The clam industry of Alaska is centered at Cordova, where two canneries were operated in 1917, one each by the Pioneer Packing Co. and the Lighthouse Canning Co., which latter concern was formerly known as the Lighthouse Canning & Packing Co. This was the first company to undertake clam canning at Cordova, operations having been started in improvised quarters in 1916. Before the digging season opened in 1917 a new building 50 by 100 feet was erected, to which the machinery was transferred.

Early in 1917 the Alaska Sea Food Co. acquired the one-line cannery built in 1916 near Point Whitshed, about 9 miles east of Cordova, and began canning operations in March. On April 4, after about 400 cases had been packed, the cannery was destroyed by fire. Reconstruction began immediately, and a modern plant was soon erected

and equipped with one line of machines, but operations were not resumed.

The Pinnacle Rock Packing Co., also a new concern, erected some small buildings at Boswell Bay and made other preparations for canning clams. Operations, however, were not commenced. The Kadiak Fisheries Co. packed a few cases of butter clams at Kodiak, and a few were also packed in southeast Alaska at Sitka by the Sitka Packing Co.

This industry shows an investment of $294,987, which is a gain of $137,044 over 1916. It gave employment to 226 persons, as compared with 78 in 1916. A total of 74,515 cases were packed, as against 10,093 cases in 1916. The value of the clam products was $274,036, as compared with $35,622 in 1916, an increase of $238,414 for 1917.

INVESTMENT IN THE CLAM-CANNING INDUSTRY IN ALASKA IN 1917.

Items.	Number.	Value.
Canneries operated	2	$51,242
Working capital		126,850
Wages paid		97,200
Vessels:		
Over 5 tons, power	1	6,586
Tonnage	25	
Launches under 5 tons	11	7,493
Rowboats and skiffs	46	4,708
Scows	1	908
Total		294,987

PERSONS ENGAGED IN THE CLAM-CANNING INDUSTRY IN ALASKA IN 1917.

Occupations and race.	Number.
Diggers: Whites	158
Shoresmen: Whites	65
Transporters: Whites	3
Total	226

PRODUCTS OF CLAM CANNERIES IN ALASKA IN 1917.

Products.	Number cases.	Value.
Clams:		
½-pound flat cans (48 per case)	30,827	$100,257
1-pound tall cans (48 per case)	[a] 41,087	165,410
2-pound tall cans (24 per case)	1,867	6,534
Clam juice:		
2-pound tall cans	682	1,705
10-pound tall cans	52	130
Total	74,515	274,036

[a] Includes 10 cases packed in southeast Alaska.

MINOR FISHERIES.

TROUT.

An appreciable increase in the production of Dolly Varden and steelhead trout in Alaska occurred in 1917. It is noteworthy that the value of these products was $16,896, as compared with $6,935 in 1916. The Midnight Sun Packing Co., at Kotzebue Sound, leads in production, having canned 1,064 cases and pickled 144 barrels of Dolly Vardens. In 1916 there were 530 cases canned and 17 barrels pickled. The quantity of fresh and frozen trout shipped from southeast Alaska in 1917 was 7,798 pounds, as against 50,822 pounds in 1916.

PRODUCTS OF THE ALASKA TROUT FISHERY IN 1917.

Section and species.	Frozen.		Fresh.		Pickled.		Canned.	
	Pounds.	*Value.*	*Pounds.*	*Value.*	*Barrels.*	*Value.*	*Cases.*	*Value.*
Southeast Alaska:								
Dolly Varden	2,470	$141	28,697	$2,836			3	$18
Steelhead	5,328	560	6,471	481				
Total	7,798	701	35,168	3,317			3	18
Central Alaska:								
Dolly Varden					17	$255	269	2,009
Steelhead							24	152
Total					17	255	293	2,161
Western Alaska:								
Dolly Varden					157	1,644	1,112	8,800
Grand total	7,798	701	35,168	3,317	174	1,899	1,408	10,979

SABLEFISH.

The production of sablefish, or black cod, as it was formerly known, was increased threefold in 1917 over that of 1916, thus indicating that there is an increasing demand for this highly nutritious fish and that it is coming into more general favor. The frozen product represents more than half of the catch, while the quantity shipped fresh was almost one-third of the total production. In 1916 a total of 304,141 pounds, valued at $11,185, was produced, as compared with the production of 1917 of 1,020,490 pounds, valued at $38,303. This is an increase in quantity of 716,349 pounds and in value of $27,118.

SHIPMENT OF SABLEFISH FROM ALASKA WATERS IN 1917.

Condition.	Pounds.	Value.
Fresh	305,804	$9,695
Frozen	574,715	21,989
Pickled	139,971	6,619
Total	1,020,490	38,303

RED ROCKFISH.

The red rockfish continues to grow in popular esteem as a food fish. This is evident from the fact that a considerable quantity was frozen by the larger companies operating cold-storage plants in Alaska. With the establishment of a trade in rockfish, fishermen will find it profitable to save all such fish, which heretofore have been thrown away in large numbers, not only because they were of little value, but in order that all space in the fishing vessels might be filled with halibut. In proportion as the demand for halibut exceeds the supply the cheaper and hitherto neglected species will be utilized.

The production of rockfish in 1917 was 150,453 pounds, valued at $3,696, as compared with 45,200 pounds in 1916, valued at $1,294. Of this amount 19,350 pounds were sold fresh for $1,075 and 131,103 pounds, valued at $2,621, were frozen.

SHRIMPS.

The Alaskan Glacier Sea Food Co., at Petersburg, pickled 65,000 pounds of shrimps, valued at $3,400. This output is slightly less than in 1916, when the total value of shrimp-fishery products was $3,750.

CRABS.

No more delectable food comes from the waters of Alaska than crabs; yet, notwithstanding their wide distribution, they are taken commercially to a very limited extent, and but two localities are reported as having produced any. According to available returns a total of 360 dozen, valued at $540, was taken at Tenakee, while 50 dozen, valued at $125, were marketed at Cordova. There is also some local use of crabs by fishermen and others at various places.

SHARKS.

The Bureau has been calling attention to the possibilities of a profitable shark fishery. This applies to the waters of Alaska as well as elsewhere. The Bureau is prepared to furnish definite information to interested persons in respect to the preparation of hides of sharks for the tanner. It has been clearly demonstrated that shark hides furnish a desirable grade of leather. The carcasses may be worked up into oil and fertilizer. It is essential that due care be exercised to avoid cutting holes in the hides during the process of skinning, as every hole in the hide lessens its value.

The Marine Products Co., with headquarters at Seattle, Wash., has made an effort to interest fishermen and others in southeastern Alaska to the end of securing sharks. In a circular issued by the company on January 2, 1918, it was pointed out that the market value of shark-liver oil in barrels, delivered at Seattle, was then from 55 to 75 cents per gallon. It was stated that No. 1 shark skins, over 6 feet in length, were worth 12 cents a pound, while No. 2 skins, under 6 feet in length, were worth 11 cents a pound. It was stated that shark meat dried, rough, unground, in sacks, at Seattle, was valued at from $50 to $60 per ton of 2,000 pounds.

Sharks may be taken in considerable numbers in various places in southeastern Alaska. The fishing gear employed especially for taking sharks is not unlike that used in the halibut fishery. It is said by the Marine Products Co. that the ground line should be either 48-pound tarred line or three-eighths cotton line, and that No. 15–0 Cirby japanned hooks set every 6 fathoms well fastened to a light flexible galvanized wire ganging, not over 3 feet long, should be used. It is said that experience has demonstrated that 300 fathoms of gear containing 50 hooks is sufficient for a set. It should be held with two regulation halibut anchors and buoyed with three or four floats. Sets should be made preferably on muddy bottom and allowed to remain from three to five hours in the daytime and throughout the night if set in the evening. It is said that salmon heads are the best bait, but that halibut heads or fresh fish of any kind will be suitable. In view of its possibilities, it would seem that the shark industry ought to be developed much more actively than has been the case heretofore.

MISCELLANEOUS FISHERY PRODUCTS.

Probably every food fish taken in Alaska has at the present time some commercial use. In part limited utilization may be due to a lack of suitable fishing gear required for the capture of a considerable quantity of fish, but as the quality of the somewhat neglected species becomes known a demand for them will be created which in turn will cause attention to be given to an improvement in methods of fishing whereby production may be augmented.

Prominent among the little utilized species are the smelt, ling cod, eulachon, tomcod, flatfish, and atkafish. The atkafish, or greenling, is a fish of recognized food value and one whose exploitation is worth undertaking. That it is not known to be generally abundant except in the extreme western part of Alaska, particularly the Aleutian Islands, is a factor which must be reckoned with in connection with the possibility of its development into a fishery of commercial importance. The isolation of the region is sufficient to close it to that class of operators who would be most likely to do the prospecting or pioneering. At present only residents of the region, or companies established in other industries in western Alaska, have access to the most promising fields, as the cost of laying down supplies at Unalaska with the means now provided by public carriers would be prohibitive. Excepting one company, none of those engaged in the salmon industry in western Alaska has attempted to develop the atkafish fields. In due time the companies engaged in the cod industry may find opportunity to investigate the possibilities of this fishery.

In 1917 the total production of miscellaneous fishery products in Alaska was 114,167 pounds, valued at $2,247.

MINOR FUR-BEARING ANIMALS.

FIELD WORK.

The field activities of a number of wardens was given almost exclusively to the enforcement of the law and regulations for the protection of the fur-bearing animals in Alaska exclusive of the Pribilofs. Other wardens as well as other officials also gave attention to these matters as far as was compatible with their other duties. The constantly increasing work which the Bureau is called upon to do not only in connection with the fisheries but with the fur-seal work as well makes it difficult to give as much attention to matters pertaining to the minor fur-bearing animals as is desirable.

In the latter part of the year a special warden was appointed at a nominal salary to attend to the Bureau's interests at Anchorage and in the adjoining region.

REGULATIONS.

No change was made in the departmental regulations for the protection of fur-bearing animals in Alaska in 1917. The regulation promulgated in 1916 affording entire protection to martens from March 15, 1916, to November 15, 1921, first imposed an actual change, from the conditions previously obtaining, in the trapping season of 1916–17. (Previous regulations had prohibited the trapping of martens each year from March 15 to November 15.) The new regulation was in general favorably received and observed.

The practice of having open seasons for various fur-bearing animals not coinciding exactly in time is open to the objection that traps lawfully set for taking certain species may take individuals of species whose capture is at the time forbidden. On this account it has been recommended that the open season for all fur bearers begin and end on the same dates. It is possible to conceive that a single period of time could be fixed upon as the open season for all protected fur bearers which would fairly take into account the various factors involved, such as breeding seasons, condition of pelage, the giving of a fair opportunity to trappers to operate, etc. The problem is complicated, however, because at times it is desired to afford complete protection to some species for a period of years.

Considerable attention was given to the question as to whether the killing of beavers should be permitted after November 1, 1918, the date when the close season as fixed by the existing regulations would expire. The complete protection afforded these animals in recent years has enabled them to reestablish themselves to a very gratifying extent. It was felt, however, that the reestablishment was more or less local in character, and that it should become more general before an open season was permitted. Furthermore, the colonial habits of the animals make it easy for trappers to practically exterminate whole settlements and it was understood that some persons had in mind the possibilities for taking beavers which would

exist as soon as the anticipated open season began. Recommendations which were received in regard to the matter were practically unanimous in expressing the hope that a longer period of protection be given the animals. Accordingly, early in 1918 the Bureau made a recommendation to the Secretary of Commerce that the existing close season be extended to November 1, 1923, which was approved by him on March 4, 1918.

FUR FARMING.

For a number of years the Bureau has published in the reports of the Alaska service information in regard to fur-farming operations in Alaska with the view of making a matter of record the status and progress of this comparatively new business and to stimulate possibly the efforts of individuals engaged in this work through a formal recognition of their activities. The Bureau has no jurisdiction over the fur-farming business aside from seeing that the law and the regulations promulgated by authority thereof are enforced. The law, aside from matters pertaining to the fur-seal fisheries, is concerned wholly with acts which involve or follow the killing of fur-bearing animals. The Bureau has no funds whereby it may carry on any experiments in fur farming in Alaska. About the only help, therefore, that the Bureau can render fur farmers is to aid as best it may in securing for them information in regard to the business.[a] Attention is in this connection invited to the work of the Department of Agriculture. The Bureau of Biological Survey of that Department is interested in the propagation of fur-bearing animals and has an experimental fur farm in northern New York. Its publications on fur farming are of decided interest.

The data which the Bureau of Fisheries secures in regard to fur farming in Alaska are obtained largely in an incidental way by employees while engaged in their formal work and by means of direct correspondence between the Bureau and fur farmers, who quite generally furnish freely information in regard to their operations. In publishing accounts of fur farms from year to year the Bureau aims chiefly to give new information which has become available.

Fur farming in Alaska is in most cases concerned with the breeding and rearing of foxes. Some attention has been given to minks and martens, and there are records of martens having been born and reared in captivity in the Territory. Skunks and raccoons have been introduced into southeastern Alaska, but nothing is known as to the success attained nor as to the reasons which led to the choice of these animals as objects of fur farming in Alaska.

A report for the season 1916 and 1917, furnished by George L. Morrison, of Hot Springs, in regard to a fox farm at Hot Springs in which he is interested, is in part as follows:

> We ranched 24 pairs of foxes, of which 5 pairs were crosses, 18 pairs were silvers, and 1 pair whites.
>
> From the 24 pairs we had 15 litters born. From the 15 litters we lost 2 litters of 5 each, one mother having buried her young trying to conceal them after having been frightened and another having lost her young on account of insufficient nourishment

[a] Note is made here of the authority of the Department of Commerce to lease a number of islands in Alaska for the propagation of foxes and other fur-bearing animals. A number of the islands are already under lease.

for them. After losing 3 in another litter of 6, we took the other 3 away from the mother and raised them successfully by hand.

From the 15 litters there were 60 pups of which we raised 35 silvers, 6 crosses, and 2 reds to maturity. The first litters were born April 25 and the last one May 30.

Our principal food is fresh and dried salmon, horse meat, wild game, rice, milk, and eggs.

We will retain 29 pairs of silvers and 1 pair of crosses this year. This pair of crosses proved to be breeders of exceptionally good stock, giving us 2 dark silvers this year.

Our ranch is located about 1,000 feet east of the town of Hot Springs, Alaska, on a sand ridge in a thick growth of cottonwood, birch, and spruce, which furnish shade in summer and shelter from the cold winds in winter. Our outside inclosure is about 300 feet square, built 12 feet high with overhang of 30 inches, and a 6-foot galvanized carpet wire, 16 gauge, which prevents the animals from burrowing under and escaping. The first 6 feet of the fence is of 14 gauge 2 -inch mesh galvanized wire; the top 6 feet is of 16-gauge 2-inch mesh, also the overhang. We might say here that we have never had a fox escape from this inclosure, and from our experience we believe a 10-foot fence would be perfectly safe.

Our breeding pens are built 70 feet on two sides from the outside fence and 50 feet from the other two sides. Thirty pens were built in 1915, size 37 by 37 of the same material and height of outside inclosure. In these pens a 3-foot 14-gauge wire is sunk in the ground and only a 3-foot carpet wire is used. Six-foot alleyways were left on two sides of each pen, and 8-foot on the other two sides. These wide alleys are quite essential to prevent the spread of disease and to keep the foxes from being annoyed at whelping time by animals in the near-by pens.

This year we added 30 more pens, 6 by 37 feet, built in the 6-foot alleys on each large pen. These pens are to be used for separating the foxes in case of sickness or to take the male away after mating in case he should be greedy or not a good parent, also to keep the young after they have been separated from the mother until they are mated, sold, or their pelts taken.

The principal losses among our young foxes are due to stomach and bowel disorders, due we believe to improper food and feeding. We are, however, overcoming this trouble to a considerable extent and in the future look for only a small percentage of loss.

We have recently taken the pelts from 16 silvers, 21 crosses, 2 reds, and 3 whites. These pelts are all exceptionally well furred, although we do not expect fancy prices this year for our silvers, as they are of our poorest stock.

Wenzel & Son, of Fairbanks, established a fox farm at Monument Point in 1915. On December 5, 1917, the stock on hand consisted of 3 male and 1 female red foxes, 2 male and 6 female cross foxes, 6 male and 12 female silver-gray foxes, a total of 30. In 1917 two litters were born. These animals consisted of 3 male and 2 female crosses and 2 male and 2 female silver grays. No animals were killed on the farm in 1916 or 1917.

The original stock for the farm was secured by trapping. It appears that with the exception of the use of bear meat for short periods on two occasions the foxes have been fed exclusively on salmon, fresh salmon being cooked and smoked salmon soaked before use.[a] Plenty of fresh water is furnished at all times.

W. J. Vachon is the owner of a fox farm located at Tolovana, Alaska. This farm was established in 1912 and the original stock was purchased. On January 5, 1918, the stock on hand consisted of 11 male and 11 female, all silver grays. In 1917, 3 litters were born on this farm. The total number of young was 18, 9 male and 9 female, all silver grays. In 1917, 29 foxes were killed on this farm, 17 male and 12 female, all silver grays. In the same year 1 animal was killed from fighting and 3 died from disease.

The structures for carrying on operations include an outside inclosure, 550 feet by 185 feet, within which there are upwards of 50 pens of various sizes. The foxes are fed fish cooked with corn

[a] The Bureau suggests that fur farmers exercise caution in using smoked food, at least until they have demonstrated that harmful results will not ensue.

meal, bone meal, crackers or rice, and fresh meat when obtainable. This farm is situated about 500 feet from the Tanana River on a sandy knoll, well-sheltered from wind.

In addition to his fox-farming operations, Mr. Vachon is also interested in the propagation and rearing of martens. The work was taken up at Tolovana, Alaska, in 1914. Presumably the experiments have been carried on with one pair of animals as a breeding stock, but definite information on this point is lacking. At any rate no young were born in 1915 or 1916. On April 29, 1917, a litter of four was born, two males and two females. It is said that these young were without hair at birth and that it was 29 days before they opened their eyes. The parents were separated some time before the young were born. The mother continually carried the young martens from one place to another until they were about two months old. All were reared to maturity, since which one has died. The food used is dried and fresh fish, scraps of meat, and birds.

L. G. Michael, Franklin, secured in 1917 from 4 pairs of foxes three litters, 2 of five and 1 of four. Starting in 1915 with 1 pair of foxes, Mr. Michael has raised 25 young foxes in three years. In November, 1917, he had a stock of 26 animals; 1 silver, 6 reds, and 19 crosses. He expected, however, to retain only 5 or 6 pairs. He had six corrals, 40 feet by 40 feet, with double compartment coops and artificial burrows in each, and planned to build three more. In regard to feeding foxes, the following is taken from Mr. Michael's report:

> I feed wild game principally, mostly rabbits, some fish, and wild berries, with an occasional ration of cooked food. Boiled meat scraps with stock thickened with rolled oats makes a food which they relish very much. Any bones, such as caribou and moose heads and legs, give them something to gnaw at. Two or three weeks before they are expected to whelp, I give the females about a pint of milk a day aside from their regular ration. I give them milk until the young are weaned. As soon as the young are big enough to come out of the coops, I give them a little milk three times a day, and a very little solid food at first, although I see that they have heavy bones with but little meat on to gnaw at.

W. H. Newton, of Healy River (Richardson post office), has continued experimental work but without a great deal of success. However, in 1917, he built some new pens and expected to continue the work.

Joseph Voelkl, 18 Mile Post, Haines. From a report made by Mr. Voelkl in October, 1917, it appeared that he had a stock of eight foxes (one black silver, five crosses, and two reds) and nine mink, six of which were young.

A. C. Smith, Porcupine, Chilkat Valley. Mr. Smith commenced fox-farming operations with Pete Duncan at Wells in 1914. The partnership was subsequently dissolved and Mr. Smith moved the two animals on hand to Porcupine. Additional animals were secured by purchase and capture. The record at hand does not indicate that any young have been reared. The foxes are fed fish, vegetables, table scraps, corn meal, and meat.

E. Hillenbrand, Pleasant Camp, Chilkat Valley, began operations in July, 1915, with four foxes, one cross and one red male, and one black and one cross female, secured by purchase and capture. While the operations have been continued, it is not known that any young born on the farm have been reared.

Otto Kraft & Son, of Kodiak, have continued their farm on Svitlak and Middle Islands, Kalsin Bay, about 15 miles from Kodiak. The firm began its operations in 1916 with animals born that year, and the year 1917 was necessarily one for carrying along the work and awaiting definite results. Fresh and dried fish are used for food; also salted salmon heads, the salt being all soaked out before the material is used.

Alex. Friedolin, of Afognak, has a fox farm on Hog Island, which is in Marmot Bay and from 3 to 4 miles from Afognak village. In November, 1917, Mr. Friedolin reported that his breeding stock consisted of four pairs of blue foxes. There are no corrals on the island, the foxes being allowed to run at large. The foxes are fed, at least in the winter, and one small building is used for the purpose of keeping food where they may go and help themselves.

Some few years ago Mr. Friedolin turned loose on Hog Island 14 field mice, hoping that they would multiply and furnish food for foxes. It is reported that the mice have increased wonderfully, that the island is alive with them, and that their food requirements have noticeably affected the vegetation growing there. It has been noted that the foxes dig for the mice here and there, and probably catch them in the open, but without any appreciable effect upon their numbers.

John Tashwak, of Afognak, continued his efforts on a small island near Afognak Island. The foxes are allowed to run at large and some have escaped by swimming to Afognak Island.

Peter J. Petrovsky, of Uyak, continued operations on Amook Island. A number of foxes have been kept in corrals or pens and a few young from these were reared in 1917. Difficulty was experienced in that a number of young were killed by their parents. The owner also had some foxes at large on Amook Island.

Frank Peterson, of Uyak, has a fur farm at Ayakulik River, west coast of Kodiak Island. From reports received from him it appears that he is making experiments with foxes in corrals built on the mainland of Kodiak Island, obtaining part or all of the animals from stock belonging to him and running at large on an island near the mouth of Ayakulik River.

A firm of which J. G. Carson, of Katalla, is a member has a fox farm on Wingham Island. A report made by Mr. Carson early in February, 1918, stated that the breeding stock consisted of six pairs of foxes, silvers and crosses. In 1917 six young were raised from two females, both bred to the same male. All that were born in these two litters were raised. Trouble was experienced at this farm in 1916 and again in 1917 on account of foxes dying. One of the members of the firm thought that the fatalities were due to the feeding of dried smoked salmon, the creosote being harmful. At the time the report referred to above was written the use of dried salmon had been stopped. Foods in use were hair-seal meat, Belgian hares, fresh fish, canned salmon (light weights), fresh beef, eggs, Spratt's dog biscuits, and bread.

For a number of years the firm also kept martens at this farm endeavoring to propagate them. Owing to difficulties encountered in impenning them they were finally removed from the island in July, 1917.

It is understood that Andrew Sholin, Homer, via Seldovia, is engaged in silver-fox farming, but details in regard to his work are not at hand.

Joseph Filardeau, of Seldovia, began fox farming in 1915 with one pair of foxes. The results obtained have warranted him in continuing his work. In November, 1917, Mr. Filardeau advised that he had entered into partnership with Mr. J. A. Herbert and that they had eight pens in the course of construction and expected to have ten pairs of breeding animals in 1918. In referring to a litter of five silver grays, Mr. Filardeau states:

> These were also raised without getting seriously sick. In July it was noticed that they were not so active as they generally were, which fact caused me considerable anxiety, prompting me to gather herbs of all varieties and give them to the animals in the hope that they would contain something of benefit to the foxes. No improvement was noticed, however, until some bunches of green sod were given, the roots growing therein appeared to be greatly relished and the immediate change that followed was unmistakably for the better.

Andrew Siewertson, of Latouche, has a fox farm on Perry Island, Prince William Sound. Two pairs of blue foxes were placed on the island in 1915. In October, 1917, the owner reported that breeding operations had not been very successful and that he was putting on his island two additional pairs secured from the Naked Island fox farm.

Stanier & Van placed four pairs of blue foxes on Axel Lind Island, Prince William Sound, in 1916. The animals were secured from fox farmers. In 1917 about six foxes were raised. The owners feel that the outlook for handling a large number of foxes is not very encouraging on account of the difficulties involved in securing supplies of fish for fox food in the face of competition for salmon for cannery use. They suggest the setting aside of a fishing ground for the use of fox farmers.

Lilzegren & Wagner have a fox farm on Little Naked Island, Prince William Sound. The foxes originally put on the island by them consisted of two pairs of blue foxes placed there in 1913. In 1914 about 10 young were raised; in 1915, about 30; in 1916, about 60; and in 1917, about 90. In 1915, 8 foxes were killed for their pelts, and in 1916, 29. Six live animals were sold in 1916. The owners expected to kill, if conditions were favorable, about 35 in 1917. Messrs. Lilzegren & Wagner feel as other farmers in this region that the question of a future supply of fish being available for use as fox food is one which should receive attention, and recommend that fox farmers pay a reasonable tax and in return have a small fishing ground set aside for their use.

F. A. Shumaker, of Latouche, and A. Lund operate jointly a fox farm on Long Island, Prince William Sound. Eighteen blue foxes, 10 females and 8 males, purchased from A. Grosvold, Sand Point, Alaska, were placed on the island in September, 1913. Forty foxes were raised in 1914, 60 in 1915, 80 in 1916, and 85 in 1917. Mr. Shumaker reported that the foxes in 1917 were too numerous for prolific breeding and that it was planned to take from 75 to 100 pelts. No pelts were taken in the years from 1913 to 1916, inclusive. One pair of live foxes was sold in 1915 and two pairs in 1916. While at present the facilities for obtaining food for the foxes on this island are satisfactory, Mr. Shumaker stated that it was getting more difficult each year for the fox farmers in the region to secure a proper

amount of food for the animals in the vicinity, and questioned whether it would not be possible to have fishing sites set aside for their use.

James McPherson, of Ellamar, occupies Peak and Naked Islands, Prince William Sound, for fox-farming purposes. It appears that the original stock consisted of four blue foxes secured from the Alaska Commercial Co. and put on one or the other of these islands in October, 1897. From records at hand it would seem that this farm has produced a considerable number of foxes annually for many years. For instance, from 1900 to 1910 the number of foxes raised each year averaged about 70. Subsequently there was a falling off for a few years. This was followed by a rise, about 90 being raised in 1915, about 85 in 1916, and about 60 in 1917.

W. C. L. Beyer and Thomas Davis placed 12 blue foxes, 7 females and 5 males, on Fairmount Island, north shore of Prince William Sound, in October, 1917. These operations are in a way a renewal of earlier ones on the part of Mr. Beyer, who states that he started work on the island in 1895 with five pairs of blue foxes. He was obliged to leave the island in 1904 and subsequent dependence upon hired help apparently demoralized the business. From other records it would appear that Fairmount Island was occupied for fox-farming purposes as early as 1897 or 1898.

J. D. Jefferson, Valdez, in April, 1917, placed three pairs of blue foxes on Bald Head Chris Island and three cross foxes on the Dutch group of islands. All these islands are in Prince William Sound. No increase was expected the first season. In November, 1917, the stock was reported thriving.

Additional information in regard to fur farms will be found in the review in this report of fur farming in southeastern Alaska, also in the section in regard to islands which may be leased by the Department of Commerce for the propagation of foxes and other fur-bearing animals.

REVIEW OF FUR FARMING IN SOUTHEASTERN ALASKA.

In the corresponding report for 1916 [a] there were published extracts from a report submitted by Inspector Walker in regard to fur-farming possibilities in southeastern Alaska. Mr. Walker continued his work of collecting data, and extracts from a subsequent report submitted by him are printed below. The report had reference to conditions and possibilities existing in southeastern Alaska, and was based on studies made and information obtained there, and the reader is cautioned against applying the conclusions to Alaska generally unless warranted by other information. Furthermore, it must be borne in mind that the business of fur-farming in Alaska, except perhaps in a few instances, is far from being established on a paying basis; that present-day operations are largely experimental; that the ultimate success of the business is not fully assured, and that statements made in regard to the future are largely deductions of individuals. Extracts from Mr. Walker's second report follow:

The history of fur farming in southeastern Alaska is, with one exception, a history of failures rather than successes. The questions that naturally follow are: Why has almost every attempt resulted in failure? Is it because the region is not suited to the enterprise?

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[a] Bureau of Fisheries Document No. 838.

Justice to the country demands that the true causes of the failures be made public, and after studying the subject from all possible viewpoints the conclusion has been reached that the failures in fur farming in southeastern Alaska have been due to the three following causes, which can in no way be charged against the industry or the region:

First. Neglect due to irresponsible drinking men being left in charge, who either failed to care for the animals or allowed them to be poached off.

Second. Persons going into the work with the idea that it would prove to be a "get-rich-quick" proposition, then becoming discouraged, running short of money and going out of business, or neglecting the animals after two or three years when they discover their mistaken idea.

Third. Perhaps a portion of the failures have as a partial cause the lack of experience and knowledge of how to handle the animals, but such trouble if had by responsible, determined men would have been charged to experience, and they would have in the future profited thereby and in the end been successful.

Some persons might believe that a certain percentage of the failures has been due to parties starting into the work without sufficient funds to carry it to a successful self-sustaining stage. This belief is true, but the situation is fully covered in the second of the reasons given for failure. Referring to the third reason given for failure, it may be said that much that is charged to lack of knowledge and experience could have been avoided by careful study, judgment, and the use of common sense. So in the end the cause of the failures may almost without exception be laid to neglect from one cause or another.

At present there is but one fur farm in southeastern Alaska that has been sufficiently long established to show its permanency and merit the name of a fur farm. This is the blue-fox ranch of James York, on Sumdum Island, which has been in operation for 19 years and is now on a firmly established basis. The blue foxes on this island have the run of the entire place, and it can not be said how many animals there are.

As a whole those attempting fur farming other than with blue foxes have been hunters, trappers, prospectors, and others who have obtained for their stock local wild animals. These persons have taken up the project as a side line and when for any cause any of their work was neglected it was the animals that suffered.

The greatest number of attempts to operate fur farms have been with red foxes, and of these there have been no less than eight, as follows:

Name of owner.	Location of farm.	Began operations.	Present status.
E. H. Richter	Skagway & Dyea	1913	Out of business.
Tom Lahey	Long Bridge, Chilkat Valley	1913	Do.
Pete Duncan	Wells, Chilkat Valley	1914	Do.
John Morrison	Haines	1913	Do.
Joseph Voelkl	18-Mile Post, Chilkat Valley	1915	Has 8 foxes.
E. Hillenbrand	Pleasant Camp, Chilkat Valley.	1915	Has 2 foxes.
A. C. Smith	Porcupine, Chilkat Valley	1915	Has 6 foxes.
Barkdahl & Green	Sokoi Island	1916	

Mink and marten farmers are next in numbers or perhaps even in greater numbers than the fox raisers, but the operations are less conspicuous and many have probably not come to notice:

Name of owner.	Location of farm.	Began operations.	Present status.
Bert Maycock	Windfall Island	1915	Unknown number of martens at liberty and doing well.
John Fanning	Etolin Island	1916	Estimated 25 martens on small island.
C. H. Barkdahl	Sokoi Island	1904	Out of business.
—— Johnson	Sitka	1913	
Simon Catt	Fanshaw Anchorage	1913 or 1914	
Joseph Voelkl	18-Mile Post, Chilkat Valley	1915	Has 9 mink.
Lewis Long	The Brothers Islands		Abandoned.

Third in number of operators come the blue-fox farmers on islands, of which there have been five attempts:

Name of owner.	Location of farm.	Began operations.	Present status.
James York	Sumdum Island	1899	Successful.
Pride & Jones	Hound Island	1905	Abandoned.
Geo. Schove	Patterson Island, then moved to The Brothers Islands in 1904.	....	Do.
C. H. Barkdahl	Sokoi Island	1905	For a time practically abandoned, but recently taken up again for further work. May be some of original stock remaining.

In addition to the above, there have been numerous single animals confined in hopes that mates for them might be obtained, usually resulting in the animals dying, being killed for fur, escaping, or being sold alive to others attempting fur farming.

Skunks and raccoons have been introduced on "Brothers Islands," but nothing has been heard of the matter recently, and it is not known as to the success. Considering the price of these skins as compared with those of some of the native fur bearers, which should be no more difficult to raise, no advantage can be seen in such a project unless the saving in feeding in winter proves to be decided.

The animals that are most available to the majority of persons in the region are minks and martens. The latter can perhaps be successfully kept on small islands if they do not fight among themselves too much. If they do prove to fight seriously when on small islands it will of course be necessary to pen them. Minks, being daring swimmers, must be penned. There is not a portion of southeastern Alaska where food is obtainable for these animals that is not suitable for them.

The red fox, with its color phases, is commonly indigenous only to that portion of southeastern Alaska west of Lynn Canal and north of Icy Strait, although they occasionally approach salt water farther south on the mainland by following down some of the larger streams and valleys. Of all southeastern Alaska only that portion in which red foxes naturally occur is to be considered for red-fox farming, and of this the section having the best combination of natural resources and advantages is the Chilkat Valley. Some of these advantages are: A climate approaching that of an interior country, in that it is clear and cold in winter and warm and dry in summer; the rainfall is the least of any portion of the district; there is an easily accessible food supply, as the fish are, or should be, abundant in the Chilkat River which flows through the valley; there is perfect drainage by reason of the sandy soil; large and permanent pens may easily be constructed because of the sandy soil underlaid at an average of about 3 feet by a hard subsoil of clay, through which foxes could scarcely dig out under the fences; the valley is easy of access both summer and winter; it is the natural home of the fox, and fortunately is in a region in which melanism is prevalent, thus producing a considerable percentage of dark individuals even from red parents; the climate while close to salt water is of an interior character which will produce fur of a superior quality surpassing that possible on the coast and islands.

As noted above, a recent attempt has been made to introduce red foxes on Sokoi Island, near Petersburg, but at present it is too early to say with what success the project is attended. The writer firmly believes that the islands are much too wet for red foxes to do well and the salt atmosphere will certainly coarsen and dull the fur more than is desirable.

The arctic or blue fox is not native to any portion of the region, but seems to have done well at every place it has been introduced so far as the climatic conditions and food are concerned. Almost any of the small islands are suitable for the raising of these animals, and the food for them may be the same as for the other animals save that as they roam at large on the island they are able to pick up more or less food for themselves from the beach and woods.

Beaver and land-otter farming have not been attempted in the district and little can be said regarding the subject. In regard to beavers, a peculiar terraine would be necessary and fencing would prove to be expensive. Land otters would require fencing, but they could be fed almost wholly from the sea foods to be had in such abundance at almost every front door in the region.

The isolated farmer should be able to supply his animals with food mainly from the ocean and streams by keeping a skate or two of halibut gear, and a crab trap or two and nets in operation near his place. The sea-food diet can be varied frequently. In season, waste scraps from deer killed for food would help out on the feeding problem. Eagles which are being killed for the bounty might be acceptable and in certain sections squirrels are obtainable in limited numbers. By a little ingenuity in their capture, mice and voles of numerous species could help vary and supplement the food. In the Chilkat Valley rabbits are obtainable some of the time.

For the farmer in or near settlements fish heads and scrap fish from the halibut fisheries and salmon canneries would almost always be available. Some butchers' scraps might also be obtainable, and many of the foods mentioned as being available to the isolated farmer would be almost as accessible to those at settlements.

Anyone undertaking the business of fur farming in southeastern Alaska or elsewhere should begin with the idea that for at least the first five years little or no profits will be realized, and that constant care and attention will be required if the industry is to be brought to a profitable stage. Fur farming must be looked upon as like any other live-stock raising. If one is expecting to build up and increase his stock he must not sacrifice the breeding animals for immediate gain.

In attempting fur farming in this region one should plan to follow either one or the other of the following courses: Arrange to have sufficient funds to carry on work for at least five years without expectation of income from the industry, or begin with only a few animals, kept as one would keep pets, giving them all necessary attention with no expectation of profit for some years. If one is to make a success in following such a course as the latter he must not neglect the care and attention of the animals even in the greater struggle of making the immediate living, for this has been the cause of failure in many cases of similar character in the past.

Poaching has been a menace to fur farming, but with industrious, determined farmers there would be little opportunity for the poacher to ply his trade.

Summarizing, it may be said that opportunities for the fur farmer in southeastern Alaska are almost unlimited, but that it is not a royal and short road to riches, and one going into it must expect to sacrifice and work as he would in any other live-stock raising. Aside from the blue foxes, the native fur bearers probably offer the best stock with which to start. Every possible encouragement and facility should be accorded the prospective fur farmers to obtain and acquire title to land on which to conduct fur farming.

SHIPMENT OF FURS FROM ALASKA.

For several years the Bureau has collected statistics of furs shipped from Alaska. It is required of shippers by departmental regulation that all shipments of furs from the Territory shall be reported to the Bueau of Fisheries.

By far the largest number of fur shipments from Alaska is made by mail. The Post Office Department has cooperated all along with the Bureau in the way of seeing that fur shipments by mail were properly reported. In 1917 that Department reaffirmed its willingness to cooperate, and under date of May 4, 1917, the Postmaster General issued an order which, while modifying somewhat the previous method of procedure, undoubtedly placed the matter upon a more satisfactory basis. The order is as follows:

Furs shipped out of Alaska by mail.

OFFICE OF THE POSTMASTER GENERAL,
Washington, May 4, 1917.

The following instructions will become effective on October 1, 1917. Before that date, the Department of Commerce will have supplied to Alaska postmasters the blanks for a new form of report to be used by persons mailing furs to points outside of that Territory:

It will be the duty of each postmaster in Alaska, on and after October 1, 1917, to furnish the report blanks to persons who present furs for mailing and to see that no furs are sent through his office to outside points until after the shipper has filled out the blank and signed the certificate as to the correctness of the report, and the postmaster has placed his signature under the words "Transmitted to the Commissioner of Fish-

eries, Washington, D. C." The postmaster will then dispatch the shipment of furs as addressed, without examining the contents for the purpose of verifying the shipper's report, and will mail the report under cover of an official penalty envelope addressed "Commissioner of Fisheries, Washington, D. C."

Postmasters should not permit their supplies of the report form to become exhausted, but in due time should make requisitions upon the Commissioner of Fisheries for specific quantities.

The present system of reporting fur shipments will remain in effect through September 30, 1917.

A. S. Burleson,
Postmaster General.

Furs were formerly the most valuable product of Alaska, and while they have yielded to the products of the mines and the fisheries the absolute value of the annual output is large.

The following table shows the detailed statistics as compiled from information furnished the Bureau in regard to the furs shipped from Alaska in the years ending November 15, 1915, 1916, and 1917:

Furs Shipped from Alaska in 1915, 1916, and 1917.[a]

Species.	Year ended Nov. 15, 1915.			Year ended Nov. 15, 1916.			Year ended Nov. 15, 1917.		
	Number of pelts.	Average value.	Total value.	Number of pelts.	Average value.	Total value.	Number of pelts.	Average value.	Total value.
Bear:									
Black	739	$7.50	$5,542.50	1,129	$9.00	$10,161.00	1,061	$14.00	$14,854.00
Brown	20	7.50	150.00	41	7.50	307.50	62	12.00	744.00
Glacier	3	50.00	150.00	5	50.00	250.00	8	20.00	160.00
Grizzly	20	20.00	400.00	14	14.00	196.00	13	17.00	221.00
Polar	......	......	....	......	......	....	[b] 144	40.00	5,760.00
Beaver	[c] 70	10.00	700.00	[d] 37	6.50	240.50	[e] 118	10.00	1,180.00
Ermine	3,538	.60	2,122.80	4,345	.80	3,476.00	4,639	.90	4,175.10
Fox:									
Black	8	400.00	3,200.00	26	250.00	6,500.00	10	160.00	1,600.00
Blue	382	50.00	19,100.00	659	50.00	32,950.00	887	58.00	51,446.00
Blue, Pribilof Islands	253	112.49	28,459.97	420	48.20	20,242.00	567	61.11	34,653.50
Cross	1,360	12.00	16,320.00	2,508	25.00	62,700.00	2,669	35.00	93,415.00
Red	11,770	8.00	94,160.00	15,711	12.00	188,532.00	10,485	24.00	251,640.00
Silver gray	187	150.00	28,050.00	318	150.00	47,700.00	443	120.00	53,160.00
White	5,967	13.00	77,571.00	6,178	20.00	123,560.00	3,682	28.00	103,096.00
White, Pribilof Islands	40	23.94	957.60	20	14.25	285.00	39	26.33	1,027.00
Hare, Arctic	51	.10	5.10	1,090	.15	163.50	89	.40	35.60
Lynx	9,374	8.00	74,922.00	21,608	12.00	259,296.00	21,210	14.00	296,940.00
Marten	3,028	6.00	18,168.00	3,100	9.00	27,900.00	[f] 1,210	14.00	16,940.00
Mink	23,073	2.00	46,146.00	22,255	4.00	89,020.00	18,832	4.00	75,328.00
Muskrat	32,933	.15	4,939.95	101,827	.35	35,639.45	72,264	.45	32,518.80
Otter:									
Land	980	8.00	7,840.00	1,330	15.00	19,950.00	1,308	15.00	19,620.00
Sea	......	......	....	[g] 1	500.00	500.00	[h] 2	344.85	689.70
Seal, fur, Pribilof Islands	3,000	30.00	90,000.00	7,061	30.00	211,830.00	[i] 9,140	30.00	274,200.00
Seal, fur	......	......	....	......	......	....	[j] 5	30.00	150.00
Squirrel	167	.05	8.35	214	.10	21.40	117	.05	5.85
Wolf	51	4.00	204.00	57	7.00	399.00	195	8.00	1,560.00
Wolverine	119	7.00	833.00	297	6.00	1,782.00	435	8.00	3,480.00
Total	......	......	519,950.27	......	......	1,143,601.35	......	......	1,338,599.55

[a] The corresponding table in the report for 1915, Bureau of Fisheries Document 834, did not include shipments of blue-fox, white-fox, or fur-seal skins from Pribilof Islands.

[b] The killing of polar bears in Alaska is unlawful. Seventeen skins were reported as being taken in extra-territorial waters.

[c] Confiscated pelts.
[d] Thirty-three shipped under permit.
[e] Includes 57 seized skins and 46 reported as Canadian pelts.
(c–e: It is unlawful to kill beavers in Alaska.)

[f] Checked against affidavits that skins were taken before Mar. 15, 1916. It is now unlawful to kill martens in Alaska.

[g] Found dead.

[h] Unlawfully killed by natives.

[i] Calendar year 1917.

[j] It is unlawful to kill fur seals within the Territorial waters of Alaska except on the Pribilof Islands.

More reliance must be placed on the cooperation of the shippers themselves in the collecting of statistics of shipments of furs by freight, express, and personal baggage than in the matter of mail shipments. The Bureau avails itself, however, of the opportunity afforded through the courtesy of the collector of customs at Juneau to check its statistics of shipments made otherwise than by mail with those of the customhouse at Juneau.

The statistics of furs shipped from Alaska are compiled annually on the basis of a year extending from November 16 of one year to November 15 of the following year. Most of the furs being taken each season within a period of a few months after November 15, it is thought that summation of the reports for the periods from November 16 of one year to November 15 of the following year will indicate as accurately as possible the take of each season.

LEASING OF ISLANDS FOR FUR FARMING.

The Department of Commerce may lease for the purpose of propagating foxes and other fur-bearing animals the Alaskan islands listed in the following table:

ISLANDS WHICH MAY BE LEASED FOR FUR FARMING.

Name of island.	Location.
Chinkof	Southwest of Kodiak Island.
Long	Near Kodiak Island.
Marmot	East of Afognak Island.
Little Koniuji	Shumagin Group.
Simeonof	Do.
Little Naked	One of Naked Islands, Prince William Sound.
Carlson (Crafton)	Prince William Sound.
Middleton	Gulf of Alaska.
Pearl	One of Chugach Islands.
Elizabeth	Do.
Aghiyuk	One of Semidi Islands
Chowiet	Do.

Of the islands listed above, five were under lease on December 31, 1917, as follows:

Name of island.	Annual rental.	Lessee.
Middleton	$200	Joseph Ibach, Cordova, Alaska
Simeonof	250	J. C. Smith, Sand Point, Alaska.
Little Koniuji	205	Andrew Grosvold, Sand Point, Alaska.
Marmot [a]	200	O. L. Grimes, Kodiak, Alaska.
Pearl	200	I. D. Nordyke, Seldovia, Alaska.

[a] Lease forfeited in 1918.

Middleton Island, Gulf of Alaska.—This island was leased in 1914 to Tim Marcum, of Valdez, for a period of five years, beginning July 1, 1914. The lease was subsequently assigned to Joseph Ibach, present address Cordova, who took possession on June 7, 1915. In December, 1914, and January, 1915, 63 foxes were killed on the island; in December, 1915, and January, 1916, 48 were killed; in December, 1916, and January, 1917, 50 were killed. In the year ended November 15, 1916, 32 live foxes were removed from the island by the lessee.

The foxes on the island run wild, and Mr. Ibach is unable to tell the total number. One year 600 Belgian hares were raised for fox food.

Simeonof Island, Shumagin Group.—This island was leased in 1914 to J. C. Smith, of Sand Point, for a period of five years, beginning July 1, 1914. Mr. Smith died July 5, 1917. It is stated that the number of blue-fox pelts, which have been secured on this island in the years from 1901 to 1917, inclusive, is 477.

Little Koniuji, Shumagin Group.—This island was leased in 1914 to Andrew Grosvold, of Sand Point, for a period of five years, beginning July 1, 1914. Mr. Grosvold has reported that on November 15, 1917, there were 37 pairs of foxes on the island.

Litigation has been carried on for a number of years between F. E. Whelpley and Andrew Grosvold in respect to the latter's rights on Little Koniuji Island. Foxing operations having been undertaken on the island by Mr. Whelpley before Mr. Grosvold secured a lease of it from the Department of Commerce, suit was instituted by Mr. Whelpley contesting Mr. Grosvold's rights. On August 2, 1916, Judge Brown, of the District Court of Alaska, in session at Valdez, decided adversely to Mr. Whelpley. The case was taken by him to the Circuit Court of Appeals at San Francisco. The decision of that court on April 1, 1918, affirmed the action of the lower court.

Marmot Island.—This island is situated near Afognak Island and was leased in 1916 to O. L. Grimes, of Kodiak, for a period of five years, beginning September 1, 1916. Under date of February 2, 1918, Mr. Grimes advised that he had forfeited the lease.

Pearl Island, Chugach Group.—This island was leased in 1917 to I. D. Nordyke, of Seldovia, for a period of five years, beginning July 1, 1917.

FUR-SEAL INDUSTRY.

PRIBILOF ISLANDS.

GENERAL ADMINISTRATIVE WORK.

In addition to various lines of work which are more or less routine in character from year to year the Bureau devoted considerable attention in 1917 to the subject of the utilization of products of the Pribilof Islands not heretofore used to any considerable extent. A part of the Bureau's efforts looking toward the exploitation of previously unused products culminated successfully while other lines of effort were being continued at the end of the calendar year. For the first time the Bureau was able to use one of its own vessels for the carrying of general cargo to and from the islands. Increased appropriations by Congress permitted sending to the islands materials for several new buildings, for repairing others, and for improving the water-supply system for the village on St. George Island. A census of the seal herds was again taken. The more important activities are taken up in detail under appropriate headings.

PERSONNEL.

The statutory employees of the Bureau on the Pribilof Islands in 1917 are listed in the introduction. As a matter of record the following information in regard to their activities and in regard to certain temporary employees is given:

Agent and Caretaker Proctor, of St. George Island, arrived there from the States on June 7, relieving G. Dallas Hanna, who had been in charge of the Bureau's work on the island since the previous October. Agent and Caretaker Fassett left St. Paul Island temporarily in December, leaving Mr. Hanna in general charge of the work there. Dr. W. Byrd Hunter, formerly physician on St. Paul Island, having reentered the Bureau's service, arrived at St. Paul Island July 23 to resume his duties as physician. Dr. Miles, who was relieved by Dr. Hunter, was transferred to St. George Island, relieving Dr. H. P. Adams, who left St. George for the States August 2. Mr. Hanna was in general charge of the fur-seal census. He was assisted by other members of the Bureau's regular force and by Dr. Harold Heath, of Stanford University. Mrs. G. Dallas Hanna had charge of the junior school on St. George Island during the school year 1916–17. Mrs. A. H. Proctor took charge of this school for the school year 1917–18. Mrs. W. Byrd Hunter was employed as a nurse on St. Paul Island beginning August 1. Warden Charles E. Crompton, having been detailed for duty at the Pribilofs, reported at St. Paul Island on June 8. Arnold C. Reynolds was relieved temporarily of his duties as school-teacher on St. George Island on October 15, his work being taken up by Mr. Crompton. Mr. Reynolds left for the States December 15. Warden H. C. Scudder, who reported at St. Paul Island for duty in September, 1916, left there July 31, 1917, for Seattle.

PURCHASE AND TRANSPORTATION OF SUPPLIES.

Food, fuel, and clothing for the natives, supplies for the general use of the Bureau's stations, materials for repairs and construction of buildings, and salt and barrels for preserving and packing seal-skins were for the most part forwarded to the islands from Seattle.

Practically all the supplies purchased in 1917 for the Pribilofs were secured from dealers who had made the most favorable terms in response to the Bureau's requests for competitive bids. As in previous years, the major portion of the Bureau's requirements for the season of 1917 were described in a series of appropriate schedules which were printed in pamphlet form and distributed among prospective bidders. Owing to the disturbed conditions which obtained in 1917, many substitutions had to be made for the commodities regularly used in the past and unusual difficulty was experienced in obtaining satisfactory bids.

About 300 tons of supplies which had been held in Seattle since the preceding fall, because facilities were not available for their transportation, were placed aboard the U. S. S. *Saturn* on May 20 and delivered in due time at the Pribilof Islands. The Bureau is under obligations to the Department of the Navy for the assistance furnished by the *Saturn*.

Through the courtesy of the Coast Guard the cutter *Unalga*, which left Seattle on May 3, carried a considerable quantity of supplies for the Pribilofs. The Bureau's supplies, together with some for the St. Paul radio station, totaled probably 50 tons by measurement. The vessel reached the Pribilofs with the supplies early in June.

The Bureau's steamer *Roosevelt* left Seattle on July 7 with a cargo of approximately 275 tons of supplies for the Pribilofs. Minor additional supplies were taken aboard at Unalaska. The shipment consisted in part of materials for six houses to be constructed for the use of natives and for the improvement of the village water supply on St. George Island. The vessel arrived at St. George Island July 21.

The *Roosevelt* left Seattle with a second cargo of supplies, consisting chiefly of foodstuffs and clothing, on September 7. An accident to the vessel's machinery caused the master to deem it advisable for the vessel to return to Seattle for repairs. The ship again left Seattle on October 23, arriving at St. George Island on November 13.

Landing supplies at Pribilofs.—It seems strange that under modern conditions no substitute which would be recognized without question as being superior to the primitive native boat, the bidarra, for lightering supplies ashore at the Pribilof Islands has been obtained. However, the bidarra is by no means an ineffective contrivance. In discharging cargo at St. George in 1917 several loads of 8½ tons deadweight each were carried, but such loadings can only be carried when little or no swell is running.

The use of canvas in place of sea-lion skins as covers for bidarras was tried in an experimental way on one at St. George Island in 1916. In order to protect the canvas from rocks, chafing strips of half-round oak were placed on this bidarra in 1917. The strips accomplished all that was expected of them. The agent in charge at St. George believes that the canvas-covered bidarra will prove as useful as those covered with sea-lion skins and that less labor will be required to keep it in repair.

As between the use of canvas or sea-lion skins as covers for bidarras, each material has some advantage over the other. With the great diminution in the supply of sea lions, the finding of some substitute for sea-lion skins seemed imperative. Sea-lion skins will withstand without puncture greater blows against jagged rocks than will canvas, and for this reason may be looked upon as being to some extent safer.

NEW BUILDINGS AND REPAIR WORK.

The act of Congress making appropriations for sundry civil expenses of the Government for the fiscal year 1917, and for other purposes, contained an item providing $20,000 for new buildings and other improvements at the Pribilof Islands. The appropriation became available too late to permit the purchase and shipment of supplies to the islands in the calendar year 1916.

It was decided that a number of new buildings, including houses for the natives and salt houses for use in salting and storing sealskins, repairs to existing buildings, and improvements to the water-supply systems for the villages were the most urgent requirements.

Six houses of the "knock-down" type were purchased and sent to the islands in 1917, four to St. Paul and two to St. George. The plans provided that each house should have a kitchen, living room, bathroom, and three bedrooms, all on one floor. It was provided also that the roof of each should be sufficiently high to permit the construction of two additional rooms on a second floor at small cost, although it was thought that the accommodations on the first floor would be sufficient for any of the large families on the islands. The agent on St. Paul Island, however, made modifications in the plans furnished him with the result that additional material will be required to complete the construction of four houses. On St. George other work interfered with beginning the erection of the two houses for that island until so late in the season that it was deemed advisable to postpone their construction until the spring of 1918.

In 1917 there were also shipped to the islands the major part of the materials for two salt houses, one for St. Paul and one for St. George, and for the proposed new water-supply system for St. George Island, as well as miscellaneous supplies for repairing already existing buildings. It is proposed to send the balance of the materials, including the supplies for the water-supply system on St. Paul Island, in 1918.

USE OF STEAMER "ROOSEVELT."

Previous to 1917 the Bureau in securing the transportation of persons and supplies to and from the Pribilofs had to depend upon courtesies afforded by other departments and upon private vessels hired or chartered. In 1917 the Bureau was able to make use of a vessel of its own, the *Roosevelt*, for the major part of the year's work. The Bureau was particularly fortunate in not being obliged to secure a privately-owned vessel, when the demand for shipping was so keen.

The *Roosevelt* arrived at Seattle on April 23, 1917, completing her voyage from the Atlantic seaboard. The principal use made of the vessel for the remainder of the year was the transportation of supplies and employees between Seattle and the Pribilofs. Two trips were made from Seattle to the islands.

On the first trip the vessel left Seattle July 7 and arrived at St. George Island July 21, having touched en route at Ketchikan, Akutan, and Unalaska. After discharging a part of the St. George cargo the vessel left for St. Paul Island on July 22, arriving there on the 23d. The work of discharging cargo, taking aboard sealskins, fox skins, bones, and other products of the islands for delivery at Seattle, and affording transportation to employees between St. Paul and St. George Islands, occupied the time until August 1, when the *Roosevelt* left for Seattle. The vessel stopped at Akutan, Ketchikan, and Prince Rupert on the way and Seattle was reached on August 18. An accident which occurred to the machinery soon after the vessel left Akutan caused some delay and a reduction in speed for the balance of the trip to Seattle.

The *Roosevelt* left Seattle with another cargo of supplies September 7 and arrived at Ketchikan September 11. An accident having occurred to the machinery the vessel returned to Seattle for repairs. A start was again made from Seattle October 23 and the Pribilofs were reached November 13, stops having been made en route at Ketchikan, Akutan, and Unalaska. Before returning to Seattle the *Roosevelt* made a trip from the islands to Unalaska for a supply of coal, 265 tons, which it delivered at the islands. The vessel finally left the Pribilofs on December 17, 1917, and arrived at Seattle on January 14, 1918. Stops were made en route at Unalaska, Akutan, Sand Point, Cold Bay, Cordova, and Ketchikan. When the vessel left the islands on December 17, there was taken along, at the request of the officer in charge of the St. Paul radio station, a man who had been employed as cook at that station but who had become insane. The man later became so violent that he was turned over to the civil authorities at Unalaska, facilities for caring for him aboard the *Roosevelt* being inadequate.

NATIVES OF THE PRIBILOF ISLANDS.

The Bureau is developing ways and means whereby the natives of the Pribilofs may be enabled to support themselves and to secure benefits for themselves individually over and above the bare necessities of life in proportion as they are industrious, economical, and thrifty. They now receive $5 in cash for each fox skin taken for the Government, and arrangements have been made whereby they receive payment for seal and other bones gathered for sale. It is probable that when definite plans are made for commercial sealing operations in 1918 some arrangement will be had whereby the natives will receive compensation in money for their sealing work in proportion to the number of properly taken skins.

HEALTH.

Physicians were maintained on both St. Paul and St. George Islands throughout the year.

As the result of suggestions made by the resident physician on St. Paul Island, Dr. W. Byrd Hunter, the following instructions were issued September 11, 1917, for both islands.

(*a*) The physician shall have direct charge of all matters pertaining to health and sanitation on the island. This, however, is not to be independent of the general authority of the agent in charge, as divided control in administrative matters is re-

garded as prejudicial to the interests of the Bureau and without compensating benefit.

(*b*) The physician shall keep an accurate record of all cases treated, giving name of patient, diagnosis, treatment, and results. He shall also make periodical physical examinations of all natives and record findings on health cards kept in the dispensary for this purpose. These records shall be open to inspection by proper persons.

(*c*) The physician shall report daily to the agent in charge the names of workmen who are totally disabled, those partially disabled, and those detained at home on account of sickness in the family. These men shall not be called upon for work unless approved by the physician.

(*d*) The physician shall report monthly to the agent in charge all medical and surgical cases treated during the month, giving the results of treatment; number of births, giving name, sex, and date of birth; number of deaths, giving name, age, sex, and cause of death; and other pertinent information. The forms of blanks submitted by the agent under date of December 5, 1916, for birth certificates, death certificates, reports of surgical operations, and christening certificates are approved by the Bureau and will be used until otherwise directed. Copies are to be furnished to the Bureau.

(*e*) The physician shall report at least annually to the Commissioner of Fisheries all medical, surgical, sanitary, or other work done during the year or period covered by such report, offering any recommendations for health improvement he may deem necessary. This report shall begin when the last preceding report ended, so that there will be no period of time not covered by a report. The original and two copies of each report shall be delivered to the agent in charge, who will forward the original to the Commissioner of Fisheries with such comments as he deems proper, retain one copy for the official files of the island, and forward one copy to the agent in charge of St. George Island for the information of the physician on that island. A copy shall also be retained in the files of the dispensary on St. Paul Island.

(*f*) The physician is authorized to condemn supplies of foodstuffs when he knows beyond any reasonable doubt that they are unfit for human or other consumption.

(*g*) The physician shall make weekly inspections of all houses in the village and the surrounding grounds and report to the agent in charge any person breaking the health regulations.

(*h*) From time to time the physician will make necessary inspections of the live stock.

(*i*) Owing to the nature of the physician's work and the likelihood of his being called at any time, day or night, he will not be required to do any station work other than his regular duties unless the circumstances are unusual or of an emergency nature. The physician will no doubt at times be glad to assist in some phases of the work not directly connected with his duties.

St. Paul Island.—In October an epidemic of influenza assumed such proportions that the vigor of the natives was materially impaired and fall sealing operations were noticeably affected.

The use of the hospital on St. Paul has been continued to advantage. The Bureau was fortunate in being able to arrange for the cooperation and services of a trained nurse, the wife of the resident physician.

It was reported that the new priest for the native congregation had shown a willingness to cooperate in an educational way in lessening insanitary church customs.

St. George Island.—In March, 1917, there broke out on this island an epidemic reported by the physician as varicella. The epidemic reached its height in April and continued into May. There were about 48 cases, and all occurred in children under 10 years of age. The physician called attention to the long lapse of time between the arrival of the last steamer, which reached the island November 3, 1916, and the commencing of the epidemic, March 21, 1917, a period of four and one-half months. Later in the year there was an epidemic of influenza, said to have been introduced from Unalaska. There were a number of mild cases, a few serious ones, and one death resulted.

SCHOOLS.

The Bureau recognizes the value of employing proper educational methods on the islands and is endeavoring to make its system of instruction increasingly effective in developing the character of the children. The responsibility resting upon those who are employed as teachers can not be too strongly emphasized, and, on the other hand, it is equally important that they be furnished with facilities and in other ways afforded the fullest possible opportunities for performing their duties.

St. Paul Island.—The 1916–17 school year began September 12, 1916, and ended June 1, 1917. Two regular teachers are employed on this island, and senior and junior schools are maintained. At the opening of the schools on September 12, 1916, the combined enrollment of pupils numbered about 64.

The following extracts are taken from the joint report submitted by the teachers for the year 1916–17:

As in the two preceding years, there has been a preparatory class for children before they begin regular first-grade work. These are children 4 and 5 years of age. There have been 11 pupils in this class. The attendance has been very irregular. This was due partly to the severity of the weather during the winter. There has been some training of hand and eye, the phonetic value of the alphabet has been taught, but no attempt has been made to teach these children to read. The greater part of the period devoted to this class (2 p. m.–3 p. m.) has been used in giving the children an English vocabulary.

The junior school building is a pleasant and well-lighted room, but it is altogether too small; the floor space is so limited that it does not admit of activities or games for the little ones.

The work in arithmetic has been arranged in grades. Concrete examples have been found necessary; blocks, sheets of paper, pencils, and other objects have been in constant use. Fractions were taught by means of cardboard circles cut into equal parts. Some of the pupils soon discarded this method and were able to think in the abstract, but many can never get beyond the "finger stage" in arithmetic. The number sense is developed in practically all children at a later age than other concepts. This is particularly true of the Aleut child. This sense is dormant until nearly the tenth year with the average, but it must be admitted that there is difficulty in speaking of the average child, for some are extremely dull and apathetic, while others would compare favorably with children in the States.

Geography with the younger ones began "at home." The pupils know their own island so well, from having visited all parts, that when the map of St. Paul is placed before them they are able to identify capes, small islands, straits, peninsulas, etc. This has led on to outline maps of North America and South America, dwelling particularly on the United States. Globe work has been coordinated continually with other map studies. Localities mentioned in the reading lessons have been pointed out at the time of reading. The pupils take an interest in the staple products brought to the islands and wish to know where "they grow" and what they "grow on," thus touching on nature study in its practical phases. With the older pupils a correlation of history with geography has been worked out in a simple manner. Reading, conversation, and composition and spelling on the same subject have been the chief studies, since nothing can be done with other textbooks unless the knowledge of the reading and conversation is sufficient.

A test of the conversational power of the pupils in English was made in the senior school. For a week all pupils were allowed to communicate with each other, with the condition that no Aleut word should be used. Of course during recitations general talking was not allowed. About 70 per cent were able to communicate all their wants and wishes to each other and to make comments on readings. It has been observed that occasionally outside school hours the children have chosen to use only English in playing some games.

About 50 books which were to be discarded were presented to the schools by the Seattle Public Library. As there was almost nothing in the way of a school library, and as these books were especially suited to younger children, they have been in constant demand and have been greatly appreciated. "The Youth's Companion," "The American Boy," and "St. Nicholas," which have been supplied to the school

are too difficult for most of the children to read, but the pictures have been enjoyed and have led to many inquiries. Both the books and magazines have been loaned to young people out of school, who have read them eagerly.

At Christmas time a public entertainment was given by the two schools, in which every child took part. All the parents were invited, and a large number attended and seemed interested in the way the children took their parts.

During March, April, and May all the older girls had a sewing lesson once a week. Almost all the native women crochet very well, but only a few of them sew well. Crocheted doilies and lace are found in every house, but buttonholes are seldom made (safety pins are substituted), and a torn garment never is mended. The sewing has been taught with the hope that a practical use may be made of it. It is recommended that material be furnished the school, and that not only sewing, but also knitting and darning lessons, be a part of the regular course for all the girls. Sometimes children who are slightly deficient mentally can do creditable work with the hands.

The older pupils have been excused from school several times during the school sessions to engage in various kinds of work on the island. During the latter part of the school year they did efficient work in gathering refuse and in general cleaning around the buildings of the village.

The reports which have come from the boys at Chemawa are good. These boys seem to be doing satisfactory work and to be contented. In regard to industrial work, it is suggested that more of the boys who go to Chemawa take up various branches of elementary mechanical work, such as blacksmithing, plumbing, and care of simple gasoline motors, etc., a line of work much needed on these islands.

In commenting on this report the Bureau approves the recommendation that instruction in needlework and knitting be made a part of the regular curriculum for the girls. Arrangements have been made to provide necessary materials.

St. George Island.—A senior and a junior school are maintained on this island. The senior school includes in general all the children between the ages of 6 and 16 years of age. The junior school is conducted principally for preparing the younger children, those under the regular school age of 6 years, for entrance into the larger school.

The senior school for the session of 1916–17 opened September 5, 1916, and closed April 27, 1917. Thirty-three pupils were in attendance, 15 boys and 18 girls. In giving instruction object lessons and concrete examples were used wherever practicable. In language work emphasis was placed upon the use of English, which, strange as it may seem, is not the habitual language of the children, although schools have been maintained at the Pribilofs under the supervision of the Government for nearly 50 years. Some of the older pupils are beginning to read the simpler stories in magazines. In arithmetic stress is placed upon practical problems. Attention was given to writing, geography, history, and spelling.

One of the classes studied a number of chapters of "Good Health," by Frances Gulick Jewett. This book is written in a form suitable for Pribilof children. An epidemic of chicken pox, which occurred on St. George Island in the year, was utilized to advantage in the way of furnishing subject matter for instruction in health problems, and the teacher's knowledge of bacteriology was also of use to him in imparting elementary information. Efforts were made to improve the moral and physical condition of the pupils, and physical-culture drills were given each morning.

The junior school was opened on October 1, 1916, and closed May 31, 1917. Nine children were in attendance. The report of the work in this school, submitted by the teacher in charge of it, indicated that considerable ingenuity had been exercised in devising methods for interesting the small children.

The senior school reopened for the school year 1917–18 on October 8, 1917, with an attendance of 33 pupils, 15 boys and 18 girls; the junior school on September 4, 1917, with an attendance of 8 pupils, 5 boys and 3 girls.

Library books.—About 400 books were forwarded to the islands for general use, these having been obtained for that purpose from the Library of Congress by the Bureau's librarian. The books were divided between St. Paul and St. George Islands. The agent in charge of St. George Island reported that a large portion of the books received by him seemed to be particularly fitted for use in the school and that a selection would be made to form the nucleus of a school library. Mention is also made of the presentation of about 50 books to the St. Paul schools by the Seattle Public Library. These books were especially suited to younger children. The teachers on St. Paul Island state that they have been in constant demand and have been greatly appreciated.

Attendance at Salem Indian Training School.—The Bureau encourages the attendance of children of the Pribilofs at the Salem Indian Training School at Chemawa, Oreg. On December 31, 1917, there were in attendance at this school from St. Paul Island the following: Ioaniky Emanoff, Agrafina Fratis, Julia (Ouliana) Fratis, Martha Fratis, Peter T. Kochergin, Alfey Melovidov, Terenty Merculieff, and Daniel Shabalin. George Lekanof, of St. George Island, was also in attendance at the school on December 31. Alexey Emanoff, of St. Paul Island, who entered the school in October, 1915, and subsequently, on account of his health, left for the school at the Fort Lapwai Sanitarium, Lapwai, Idaho, was still at the sanitarium on December 31. Constantine Lestenkof, of St. George Island, who entered the school in August, 1914, returned home in 1917. Children who attend the school at Chemawa do not always return to the Pribilofs to live.

It has been stated that the children from the Pribilof Islands are noticeably among the very best coming to the school from any place, that they give less trouble than any other group of children, and that their progress is very satisfactory.

MOTION PICTURES.

In 1916 the Bureau sent to St. Paul Island 100,000 feet of motion-picture films. The material was supplied chiefly for the purpose of affording instruction and recreation to the natives. Employees of the radio station on the island agreed to supply a machine for showing the pictures. The natives received the entertainments provided most enthusiastically. Comedy, news, and educational subjects appeared to be the most appreciated. Owing to the undoubted value of this form of entertainment, another supply of films was sent to St. Paul in 1917. The Bureau rents the pictures for the winter season or until such time as they can be returned in the following spring or summer.

SAVINGS ACCOUNTS.

A number of the natives of the Pribilofs have personal funds which have been placed by them in the custody of the United States Commissioner of Fisheries as trustee. Throughout the year 1917 these

funds were kept on deposit with the Washington Loan & Trust Co., Washington, D. C. Each native whose funds are concerned has the privilege of securing any portion of his share at any time upon request.

The funds on deposit draw interest at the rate of 3 per cent per annum, which is calculated on monthly balances. Interest is credited semiannually. The Commissioner's records of the funds are subject to an auditing every six months by the disbursing clerk for the Department.

On January 1, 1917, the total amount of the funds, including interest, $70.78, credited on that date was $4,729.36. Funds of Polyxenia Merculiof, of St. George Island, amounting to $107.41, were deposited March 8, 1917. Interest credited July 1, 1917, amounted to $68.52. Withdrawals during the year amounted to $516.67. The balance on December 31, 1917, including interest, $66.36, credited on that date was $4,454.98.

PRIBILOF ISLANDS NATIVES' SAVINGS ACCOUNTS IN THE CUSTODY OF THE UNITED STATES COMMISSIONER OF FISHERIES, AS TRUSTEE, DEC. 31, 1917.

Funds of—	Amount.	Funds of—	Amount.
St. Paul Island:		St. Paul Island—Continued.	
Bourdukofsky, Apollon	$205.64	Merculieff, Paul A.	$13.86
Bourdukofsky, Peter	137.33	Merculieff, Terenty	35.39
Diakanof, Auxenia (Mrs. C. H. Hope) [a]	23.56	Oustigoff, Peter	71.65
Emanoff, Alexey [a]	270.41	Pankoff, Agrippina	314.48
Fratis, Agrifina [a]	85.00	Pankoff, Maria M.	39.46
Fratis, Akalina [a]	500.93	Rukovishnikoff, Elisaveta	13.49
Fratis, Martha [a]	84.98	Sedick, Marina	15.53
Fratis, Ouliana [a]	84.98	Tetoff, Vikenty M.	39.45
Gromoff, Iuliania	868.53	St. George Island:	
Hanson, John	46.58	Galanin, Mary	264.26
Kozloff, Parascovia	179.60	Lestenkof, Michael	206.65
Krukoff, Iuleta	108.89	Merculiof, Agrifina	113.18
Mandregan, Alexandra M. [b]	39.46	Merculiof, Joseph	71.77
Melovidov, Alfey	39.46	Merculiof, Polyxenia	109.83
Melovidov, Anton	3.40	Philomonof, Mary [c]	108.49
Melovidov, Iosef	39.46	Philomonof, Zoya	107.35
Merculieff, Dosofey	35.39	Shane, Michael	76.55
Merculieff, Makary	35.39	Zacharof, Emanuel	29.21
Merculieff, Mariamna	35.39	Total	4,454.98

[a] Not living on islands in 1917. [b] Formerly Alexandra Melovidov. [c] Deceased, estate undivided.

CENSUS.

In order to make certain facts in regard to the inhabitants of the Pribilof Islands a matter of official record an annual census is taken of the natives on each island. The census in 1917 was taken as of March 31 and the more salient details follow:

Natives Resident on St. Paul Island, Alaska, Mar. 31, 1917.

Names of individuals (grouped by families).	Age last birthday.	Birthplace.
Balakshin, Matrona	68	St. Paul Island.
Bourdukofsky, Apollon.	63	Unalaska, Alaska.
Bourdukofsky, Peter	37	St. Paul Island.
Bourdukofsky, Alexandra.	25	Marjovi, Alaska.
Bourdukofsky, Helen S.	11	St. Paul Island.
Bourdukofsky, Martha.	5	Do.
Buterin, Constantine	30	Do.
Buterin, Marina	26	St. George Island.
Buterin, Alexandra	4	St. Paul Island.
Buterin, Karp	65	Do.
Buterin, Parascovia	62	Unalaska, Alaska.
Buterin, Iuliania E.	8	St. Paul Island.
Buterin, Maxim K.	4	Do.
Emanoff, Mary	42	Atka, Alaska.
Emanoff, Mamant	10	St. Paul Island.
Emanoff, Maxim	5	Do.
Emanoff, Peter	13	Do.
Fratis, John	30	Do.
Fratis, Snandulia	26	Do.
Fratis, Anfesa	(a)	Do.
Fratis, Anton	4	Do.
Fratis, David	6	Do
Galaktionoff, Lukia	40	Do
Galaktionoff, Aggey	10	Do.
Galaktionoff, Elena	7	Do.
Galaktionoff, Maria	14	Do.
Galaktionoff, Matrona	13	Do.
Gromoff, Iuliania	48	Do.
Gromoff, Elary S.	15	Do.
Hanson, Anna	16	Do.
Hanson, John.	20	Do.
Hanson, Chionia	21	Do.
Hapoff, Nekita	28	Do.
Hapoff, Parascovia	28	Do.
Hapoff, John	8	Do.
Hapoff, Platonida	6	Do.
Hapoff, Valentina	2	Do.
Kochergin, Gregory	39	Do.
Kochergin, Agafia	38	Do.
Kochergin, Gavriel S.	5	Do.
Kochutin, Jacob	65	Do.
Kochutin, Alexandra.	53	Unalaska, Alaska.
Kochutin, John	46	St. Paul Island.
Kochutin, Klavdia	36	St. George Island.
Kochutin, Erena	13	St. Paul Island.
Kochutin, Simeon	5	Do.
Kochutin, Theodore	28	Do.
Kochutin, Maria	30	Do.
Kochutin, Anna	2	Do.
Kochutin, Avgusta	5	Do.
Kochutin, Jacob	(a)	Do.
Kochutin, Karp	11	Do.
Kochutin, Nekifer	4	Do.
Kochutin, Prascodia.	8	Do.
Kochutin, Zenovia	48	Do.
Kochutin, Innokenty.	14	Do.
Kozeroff, Uvanaly	28	Do.
Kozeroff, Fekla	22	St. George Island.
Kozeroff, Alexandra	2	St. Paul Island.
Kozeroff, Vassa	(a)	Do.
Kozhevnikoff, Paul	34	St. Paul Island.
Kozhevnikoff, Maria	42	St. George Island.
Kozhevnikoff, Evdokia.	8	St. Paul Island.
Kozloff, Michael	31	Do.
Kozloff, Iustinia	41	Kiska Island, Alaska.
Kozloff, Olga	3	St. Paul Island.
Kozloff, Raisa	1	Do.
Kozloff, Nicolai	29	Do.
Kozloff, Olga	26	Holy Cross Mission, Alaska.
Kozloff, Parascovia	58	Unalaska, Alaska.
Krukoff, Condrat	27	St. Paul Island.
Krukoff, Vassa	22	Do.
Krukoff, Daniel	2	Do.
Krukoff, Samuel	(a)	Do.
Krukoff, Ekaterina	58	Kamchatka, Siberia.
Krukoff, John	36	St. Paul Island.
Krukoff, Iuleta	32	Do.
Krukoff, Alexandra	10	Do.
Krukoff, Kleopatra	6	Do.
Krukoff, Tatiana	8	Do.
Krukoff, Metrofan	33	Do.
Krukoff, Pelagia	29	St. George Island.
Krukoff, Matfey	7	St. Paul Island.
Krukoff, Paul	2	Do.
Kushin, Elena	24	Marjovi, Alaska.
Kushin, John H.	2	St. Paul Island.
Kushin, Michael	32	Do.
Kushin, Matrona	25	Do.
Kushin, Anton F.	(a)	Do.
Kushin, Glekeria	4	Do.
Mandregan, Innokenty.	26	Do.
Mandregan, Maria	19	Do.
Mandregan, Agafia	1	Do.
Mandregan, Nekifer	21	Do.
Melovidov, Anton	23	Do.
Melovidov, Alexandra	21	Do.
Melovidov, Solomonia	41	Do.
Melovidov, Alexandra	15	Do.
Melovidov, Alfey	13	Do.
Melovidov, Iosef	10	Do.
Merculieff, Agafia	38	Do.
Merculieff, Dosofey	12	Do.
Merculieff, Makary	8	Do.
Merculieff, Mariamna	6	Do.
Merculieff, Terenty	13	Do.
Merculieff, John	33	Do.
Merculieff, Evdokia	46	St. Michael, Alaska
Merculieff, Leonty	9	St. Paul Island.
Merculieff, Serafima	12	Do.
Merculieff, Paul	27	Do.
Merculieff, Maria	24	Umnak Island, Alaska.
Merculieff, Abraham S.	2	St. Paul Island.
Merculieff, Paul A.	22	Do.
Misikin, John	27	Do.
Misikin, Natalia	30	Unalaska, Alaska.
Misikin, Anna	7	St. Paul Island.
Misikin, Victor	8	Do.

[a] Infant.

NATIVES RESIDENT ON ST. PAUL ISLAND, ALASKA, MAR. 31, 1917—Continued.

Names of individuals (grouped by families).	Age last birthday.	Birthplace.
Nozekoff, Simeon	40	Unalaska, Alaska.
Nozekoff, Haretina R.	9	St. Paul Island.
Nozekoff, Maria	19	Do.
Nozekoff, John T.	12	Do.
Oustigoff, Neil	26	Do.
Oustigoff, Mary	21	Do.
Oustigoff, Peter	52	St. George Island.
Oustigoff, Elena	43	St. Paul Island.
Oustigoff, Andronik	1	Do.
Oustigoff, Dmitri	12	Unalaska, Alaska.
Oustigoff, Parascovia	8	St. Paul Island.
Pankoff, Porfiry	55	Do.
Pankoff, Varvara	35	Attu Island, Alaska.
Pankoff, Maria M.	7	St. Paul Island.
Pankoff, Vlass	29	Do.
Pankoff, Agrippina	28	Do.
Rukovishnikoff, Stefan.	36	Do.
Rukovishnikoff, Elisaveta.	29	Do.
Rukovishnikoff, Andrey.	11	Do.
Rukovishnikoff, Eloknida B.	1	Do.
Rukovishnikoff, Geo.	4	Do.
Rukovishnikoff, Ifrosenia.	(a)	Do.
Rukovishnikoff, Marfa	7	Do.
Sedick, Feodosey	73	Do.
Sedick, Innokenty	32	Do.
Sedick, Ripsimia	24	Do.
Sedick, Feofania	6	Do.
Sedick, Lavrenty	1	Do.
Sedick, Leonty	3	Do.
Sedick, John	19	Do.
Sedick, Marina	18	Do.
Shabalin, Daniel	14	Do.
Shabalin, Matrona	16	Do.
Shaishnikoff, George	34	Do.
Shaishnikoff, Evdokia	26	Unalaska, Alaska.
Shaishnikoff, Serge	11	St. Paul Island.
Shaposhnikoff, Parascovia.	50	St. Paul Island.
Stepetin, Dorofey	46	Do.
Stepetin, Lubov	37	Do.
Stepetin, Epaty	7	Do.
Stepetin, Kapetolina	4	Do.
Stepetin, Xenia	18	Do.
Stepetin, Elary	53	Do.
Stepetin, Anna	38	Unalaska, Alaska.
Stepetin, Andrey	3	St. Paul Island.
Stepetin, Nicolai	13	Do.
Stepetin, Peter	8	Do.
Stepetin, John	37	Do.
Stepetin, Vera	36	Do.
Stepetin, Alexandra	6	Do.
Stepetin, Elarion	12	Do.
Stepetin, Evdokia	8	Do.
Stepetin, Olga	10	Do.
Stepetin, Vasilii	15	Do.
Stepetin, Vasilii	24	Do.
Stepetin, Mavra	18	Do.
Stepetin, Auxenty	9	Do.
Tetoff, Neon	47	Do.
Tetoff, Agrippina	41	Unalaska, Alaska.
Tetoff, Agnia	3	St. Paul Island.
Tetoff, Agrippina	14	Do.
Tetoff, Anna	10	Do.
Tetoff, Dmitri	19	Do.
Tetoff, Ekaterina	(a)	Do.
Tetoff, Erena	17	Do.
Tetoff, Sosepatra	5	Do.
Tetoff, Peter	52	Do.
Tetoff, Maria	55	St. George Island.
Tetoff, Vikenty M.	6	St. Paul Island.
Tetoff, Zachar	37	Do.
Tetoff, Daria	36	St. George Island.
Tetoff, Feodosia	3	St. Paul Island.
Tetoff, Paul	11	Do.
Tetoff, Tatiana	1	Do.
Tetoff, Venedict	10	Do.
Vikaloff, Alexander	19	Do.

NATIVES RESIDENT ON ST. GEORGE ISLAND, ALASKA, MAR. 31, 1917.

Names of individuals (grouped by families).	Age last birthday.	Birthplace.
Galanin, Alexander	31	St. George Island.
Galanin, Mary	25	St. Paul Island.
Galanin, Katherine	7	St. George Island.
Galanin, Helena	5	Do.
Galanin, Moses	3	Do.
Galanin, John	35	Do.
Galanin, Anna	35	St. Paul Island.
Galanin, Gabriel	7	St. George Island.
Galanin, Raphael	3	Do.
Galanin, Xenephont	2	Do.
Galanin, Augusta	(a)	Do.
Galanin, Akalina	54	St. Paul Island.
Kashevarof, Peter	60	Kodiak, Alaska.
Kashevarof, Anna	52	Do.
Pavlof, Katherine	23	Belkofsky, Alaska.
Philomonof, Helena	12	St. George Island.
Kashevarof, Walter	29	Belkofsky, Alaska.
Kashevarof, Helena	32	St. George Island.
Kashevarof, Andrew	9	Do.
Kashevarof, Nina	8	Do.
Kashevarof, Laurence	6	Do.
Kashevarof, Valentine.	4	Do.
Kashevarof, Peter	3	Do.

a Infant.

NATIVES RESIDENT ON ST. GEORGE ISLAND, ALASKA, MAR. 31, 1917—Continued.

Names of individuals (grouped by families).	Age last birthday.	Birthplace.	Names of individuals (grouped by families).	Age last birthday.	Birthplace.
Lekanof, Anatole	26	St. George Island.	Merculiof, Stepan	26	Do.
Lekanof, Agnes	22	St. Paul Island.	Merculiof, Agrafina	19	St. Paul Island.
Lekanof, Alexandra	5	St. George Island.	Merculiof, Natalia	2	St. George Island.
Lekanof, Laurence	1	Do.	Merculiof, Nadesda	(a)	Do.
Lekanof, Stepan	47	Unalaska, Alaska.	Merculiof, Alexandra	38	Do.
Lekanof, Pelegia	47	St. George Island.			
Lekanof, Sergius	25	Do.	Niderazof, Isidor	26	Do.
Nozekof, Paul	20	Do.	Niderazof, Alexandra	25	St. Paul Island.
			Niderazof, Clement	4	St. George Island.
Lestenkof, Demetri	54	Atka, Alaska.			
Lestenkof, Alexandra	37	St. Paul Island.	Philomonof, Simeon	66	Do.
Lestenkof, Elizabeth	9	St. George Island.	Philomonof, Zoya	24	Do.
Lestenkof, Innokenty	7	Do.	Philomonof, Ignati	17	Do.
Lestenkof, Theodore	4	Do.	Philomonof, Julia	15	Do.
Lestenkof, Michael	3	Do.	Philomonof, Nadesda	6	Do.
Lestenkof, Ludmilla	1	Do.	Philomonof, Isaac	4	Do.
Lestenkof, Michael	44	Atka, Alaska.	Philomonof, Andronic.	49	Do.
Lestenkof, Oulita	47	St. George Island.			
Lestenkof, Anna	18	Do.	Philomonof, Zenobia	50	Unalaska, Alaska.
Shabolin, Julia	3	Do.	Philomonof, Leonti	22	St. George Island.
			Philomonof, Alexandra.	20	Do.
Malavansky, Nicoli	52	Do.			
			Philomonof, Eoff	14	Do.
Malavansky, Ripsimia.	59	Do.			
			Philomonof, Zoya	31	St. Paul Island.
Malavansky, Wassie	42	Do.	Swetzof, Agnes	10	St. George Island.
Malavansky, Christopher.	12	Do.	Swetzof, Eleazar	7	Do.
			Shabolin, Varvara	19	St. Paul Island.
Malavansky, Julia	5	Do.	Shabolin, Helena	(a)	St. George Island.
Merculiof, George	43	Do.	Prokopiof, Peter	52	Attu, Alaska.
Merculiof, Stepenida	38	Do.	Prokopiof, Stepenida	40	St. George Island.
Merculiof, Peter	17	Do.	Prokopiof, Martha	21	Do.
Merculiof, Sophia	15	Do.	Prokopiof, Marina	19	Do.
Merculiof, George, jr.	13	Do.	Prokopiof, Alexander	14	Do.
Merculiof, Nicoli	11	Do.	Prokopiof, Laurence	13	Do.
Merculiof, Alexandra	9	Do.	Prokopiof, Fevronia	11	Do.
Merculiof, Daniel	5	Do.	Prokopiof, Mary	10	Do.
Merculiof, Tetiana	2	Do.	Prokopiof, Anna	8	Do.
Merculiof, Irene	(a)	Do.	Prokopiof, Afanasia	7	Do.
Merculiof, Martha	23	Do.	Prokopiof, Martha, 2d	6	Do.
			Prokopiof, Helena	5	Do.
Merculiof, John	27	Do.	Prokopiof, Sophia	3	Do.
Merculiof, Sarah	23	Do.	Prokopiof, Michael	1	Do.
Merculiof, Mouza	3	Do.	Prokopiof, Alexai	(a)	Do.
Merculiof, Lubof	(a)	Do.			
			Shane, Michael	29	Do.
Merculiof, Joseph	45	Do.	Shane, Marina	22	Do.
Merculiof, Katherine	24	Akutan, Alaska.	Shane, Serefimia	(a)	Do.
Merculiof, Polyxenia	7	St. George Island.	Shane, Riese	65	Do.
Merculiof, Joseph, jr.	1	Do.			
Merculiof, Vasili	(a)	Do.	Swetzof, Paul	24	Do.
			Galanin, Fevronia	39	Do.
Merculiof, Nicoli	36	Do.			
Merculiof, Laurence	14	Do.	Zacharof, Emanuel	36	St. Paul Island.
Merculiof, Benjamin	11	Do.	Zacharof, Mary	42	Do.
Merculiof, Elizabeth	9	Do.	Zacharof, Daria	14	St. George Island.
Merculiof, Nicoli, jr.	7	Do.	Zacharof, Katherine	11	Do.
Merculiof, Angelina	5	Do.	Zacharof, Cleopatra	(a)	Do.

a Infant.

Certain statistical details in regard to the natives of St. Paul and St. George Islands are as follows:

St. Paul Island:	
Resident population June 30, 1916	192
Births in period July 1, 1916, to Mar. 31, 1917	6
Deaths in period July 1, 1916, to Mar. 31, 1917	3
Departures (children to attend Salem Indian Training School at Chemawa, Oreg.) in period July 1, 1916, to Mar. 31, 1917	2
Resident population Mar. 31, 1917	193
St. George Island:	
Resident population June 30, 1916	119
Births in period July 1, 1916, to Mar. 31, 1917	8
Deaths in period July 1, 1916, to Mar. 31, 1917	4
Resident population Mar. 31, 1917	123

It will be noted that the total native population resident on the islands on March 31, 1917, was 316.

FUR-SEAL HERD.

KILLING OF SEALS.

St. Paul Island.—The first killing of seals on St. Paul Island in 1917 took place on April 6. Killings were continued at intervals until December 17. In all 25 drives were made. The total number of seals killed was 4,986, and a corresponding number of skins was taken.

St. George Island.—On St. George Island the first seals were killed on May 28, and killing operations were continued until November 10. Twenty-five drives were made in the year. The number of seals killed in the year was 3,183. In addition to the skins taken from the seals killed, one was secured from a bull found dead on a rookery, the total number of skins secured in the year being, therefore, 3,184.

From the above it will be noted that the total number of fur seals killed on both islands in 1917 was 8,169.

Record of Fur Seals Killed on St. Paul Island, Alaska, in the Calendar Year 1917.

Date.	Hauling ground driven.	Number.	Date.	Hauling ground driven.	Number.
Apr. 6	Sivutch (Sea Lion Rock)	[a] 57	Oct. 6	Gorbatch—parade ground	12
May 31	Reef	[a] 63	16	do	25
June 11	do	[b] 73	22	Reef—parade ground	305
20	do	59	25	do	341
30	do	[a] 441	27	do	103
July 3	Gorbatch	[a] 325	Nov. 1	Reef and Gorbatch	87
7	do	382	6	Zapadni	25
11	Reef	838	7	Reef Peninsula	89
16	Tolstoi and Lukanin	[c] 299	10	Reef and Gorbatch	41
21	Gorbatch	362	Dec. 17	Reef Peninsula	92
Aug. 1	do	[c] 389		Seals killed between May 16 and Nov. 10, dates inclusive, by guards at Northeast Point	47
4	do	234			
10	do	[a] 286			
25	Gorbatch—parade ground	6		Total	4,986
Sept. 8	do	5			

[a] Includes 1 which died as result of drive, not slaughtered.
[b] Includes 3 which died as result of drive, not slaughtered.
[c] Includes 2 which died as result of drive, not slaughtered.

RECORD OF FUR SEALS KILLED ON ST. GEORGE ISLAND, ALASKA, IN THE CALENDAR YEAR 1917.

Date.	Hauling ground driven.	Number.	Date.	Hauling ground driven.	Number.
May 28	Staraya Artil	47	Aug. 19	Zapadni	c 1
June 4	East	40	23	North	c 11
11	North	14	28	....do	c 11
19	East	47	Sept. 10	....do	c 11
20	North	50	Oct. 13	....do	c 4
25	Staraya Artil	17	15	....do	c 5
27	East	201	17	....do	c 10
30	North	109	19	....do	c 7
July 6	Staraya Artil	a 115	22	East	210
7	East	b 314	23	North	139
7	Zapadni	c 2	23	Staraya Artil	73
13	North	a 205	26	Zapadni	8
17	Staraya Artil	406	27	East	22
18	Zapadni	c 1	30	North	56
27	North	167	Nov. 2	East	126
Aug. 3	East	b 338	9	North	60
6	Zapadni	c 1	10	Staraya Artil	35
8	North	a 193			
10	East	a 125		Total	3,183
11	....do	c 2			

a Includes 1 which died as result of drive, not slaughtered.
b Includes 3 which died as result of drive, not slaughtered.
c Seals snared from edge of bachelors on hauling ground, not taken up in a drive.

The corresponding tables for 1916 in the Report on the Alaska Fisheries and Fur Industries in 1916 [a] were incomplete in respect to details of certain killings made late in the year. In order that these records may be available, the completed tables for 1916 are now published. It will be noted that the number of seals killed on St. George Island was 2 more than the tentative number stated in the 1916 report.

RECORD OF FUR SEALS KILLED ON ST. PAUL ISLAND IN THE CALENDAR YEAR 1916.

Date.	Hauling ground driven.	Number.	Date.	Hauling ground driven.	Number.
Mar. 3	Sivutch (Sea Lion Rock)	59	July 29	Northeast Point	1
May 27	Reef	b 101	Aug. 1	Tolstoi	241
30	Northeast Point	1	4	....do	c 117
June 3	Reef	67	9	Northeast Point	1
3	Polovina	1	11	Gorbatch	59
7	Northeast Point	1	Sept. 3	Northeast Point	1
10	Polovina	1	4	Gorbatch	61
12	Reef	209	12	Northeast Point	1
14	Northeast Point	1	Oct. 12	....do	1
17	Polovina	1	17	Tolstoi	53
22	Northeast Point	1	17	Northeast Point	1
23	Reef	60	27	Reef Peninsula	113
27	Northeast Point	1	Nov. 1	Northeast Point	1
30	Reef and Gorbatch	366	4	Reef	73
July 5	Northeast Point	1	7	Northeast Point	59
6	Gorbatch	c 113	8	....do	23
10	Reef and parade ground	d 272	13	Tolstoi	44
15	Reef and Gorbatch	481	13	Northeast Point	1
18	Northeast Point	1	15	....do	1
20	Reef and Gorbatch	e 1	28	Reef	139
22	Reef	93	29	....do	h 1
24	....do	f 195	Dec. 5	Northeast Point	1
26	Reef and Gorbatch	g 284			
27	Northeast Point	1		Total	3,483
29	Gorbatch	c 178			

a Bureau of Fisheries Document No. 838.
b Includes 1 which died on drive and 11 which were suffocated on killing field.
c Includes 1 which died on drive.
d Includes 2 which died on drive.
e Found dead on line of drive of July 15.
f Includes 5 which died on drive.
g Includes 18 which died on drive.
h Found dead; apparently escaped from drive made for killing of November 28.

Record of Fur Seals Killed on St. George Island in the Calendar Year 1916.

Date.	Hauling ground driven.	Number.	Date.	Hauling ground driven.	Number.
June 9	East Cliffs	32	Aug. 3	East Cliffs	213
13	Zapadni	2	5	North	145
15	North	34	8	East Cliffs	40
22	Staraya Artil	49	10	North	94
22	Zapadni	1	10	Zapadni	1
24	East Cliffs	123	Oct. 16		1
27	North	201	20	Staraya Artil	40
29	Staraya Artil	55	23	East	78
July 1	East Cliffs	115	27	Staraya Artil and North	88
5	North	169	Nov. 1	Zapadni	6
7	East Cliffs	109	2	North	a 72
11	Staraya Artil	71	8	Staraya Artil	106
12	North	295	9	East Reef	34
15	East Cliffs	355	10	North	26
16	Zapadni	1	14	North and Staraya Artil	b 33
22	do	1	16	North	12
24	North	128	22	Staraya Artil	10
27	Zapadni	22			
29	East Cliffs	103		Total	2,985
Aug. 1	North	120			

a Includes 1 which died on killing field. b Includes 1 pup accidentally injured.

The number of skins obtained at the Pribilofs does not necessarily correspond exactly with the number of seals killed, for from time to time a merchantable skin may be obtained from a seal found dead.

Resumption of commercial killings.—The drastic restrictions placed upon the killing of fur seals on the Pribilof Islands by the act of Congress, approved August 24, 1912, giving effect to the North Pacific Sealing Convention of July 7, 1911, terminated August 24, 1917. For five years the killing of seals at the islands had been limited by law to the number of animals required for the immediate use of the native inhabitants. The Department planned to place killing operations on a commercial basis upon the termination of the five-year period. Inasmuch as the Governments of Great Britain and Japan are each entitled to a share of sealskins taken commercially on the Pribilof Islands, the time when commercial operations began must be clearly established. This date was August 25, 1917. The number of skins taken on the Pribilofs in the period beginning August 25 and ending December 31, 1917, both dates inclusive, was 1,943. Eleven hundred and sixty-six were taken on St. Paul Island and 777 on St. George Island. Of these 1,943 skins, 1,831 were shipped from the Pribilofs in December, 1,054 from St. Paul, and 777 from St. George.

UTILIZATION OF WASTE PRODUCTS.

The Bureau continued throughout the year its efforts to utilize in economic ways products of the Pribilofs which have in the past either in part or wholly gone to waste. A serious handicap is the isolation of the islands, which sometimes results in months elapsing before the completion of investigations which under ordinary conditions could be completed in as many weeks or even days.

Among the products which the Bureau has endeavored to develop are bones remaining from former killings of seals and sea lions, seal intestines as sausage casings, oil and gelatine from seal carcasses, corned seal shoulders, canned meat, and the gullets or throats of seals.

Bone.—The initial shipments of old bone were made from the Pribilofs in 1917. The first shipment was made on the *Roosevelt* leaving the islands in August. The bone was delivered at Seattle and sold to Elmon A. Geneste, representing the Union Meat Co., of North Portland, Oreg. The shipment amounted to 32,170 pounds, and the Bureau received from Mr. Geneste $321.70, or at the rate of $20 per ton. Natives were paid $179.68 for collecting the material. The balance, $142.02, was deposited in the Treasury.

The second shipment amounting to 161,400 pounds was made on the *Roosevelt* leaving the islands in December. The material was delivered to Brady & Co., of Seattle, at that place in January, 1918. The price at which it was sold was $30 per ton, the gross amount being $2,421. From this there were deductions of $333.18 for wharfage, labor in unloading, etc., at Seattle. There was also deducted the sum of $807, paid 55 natives at the islands, who received one-half cent per pound for bone collected. Thus the net amount to be turned into the Treasury was $1,280.82.

In order that bone might be transported in more compact form, thereby economizing space on the *Roosevelt*, two small crushers were shipped to the islands. Delivery was made at the islands too late in the year to permit the grinding of bone shipped in 1917.

Intestines.—A small quantity of salted fur-seal intestines were shipped from St. Paul Island on the *Roosevelt* in December, 1917. Samples of the intestines were submitted to the Bureau of Animal Industry and to the trade. Preliminary tests made with the view of utilizing them for sausage casings were not promising, but observations made in the course of these tests suggested their suitableness for sutures, violin strings, tennis rackets, etc. Ordinary so-called catgut of commerce is made from intestines of sheep. Intestines from fur seals are thinner and stronger than those from sheep.

Oil and gelatine.—Steps were undertaken to ascertain what possibilities lay in the extraction of oil from seal carcasses. Kettles for use in trying out oil were sent to both St. Paul and St. George Islands, but it may be that any open-kettle process is unsuited for the work. A trial was made on St. Paul Island, using a pressure cooker sent there for experimenting in the canning of seal meat. The blubber, weighing 18 pounds 6 ounces, left on an average fall 3-year-old male seal after removal of the pelt in the regular manner, was minced and cooked for two hours under 19 pounds of steam. The product was then pressed under a small press, yielding 7 pounds 12 ounces of oil, 4 pounds 2 ounces gelatine solution, and 6 pounds 6 ounces residue. Experiments indicate that 1 to 2 gallons of oil, 3 to 8 pounds gelatine, and 30 to 90 pounds of animal meal may be obtained from each seal. A fur-seal flipper weighing 42 ounces yielded 18 ounces transparent gelatine, 2 ounces oil, 16 ounces solids, and 6 ounces of water after cooking two hours under 17 pounds of steam; all four flippers of an average-sized 3-year-old fur seal killed in December weighed 6 pounds. Tests made with blubber shipped from the Pribilofs in 1916 indicated 30 per cent of oil by weight in one case and 38 per cent in another.

Shoulders.—A barrel of corned fur-seal shoulders was also shipped from St. Paul Island on the *Roosevelt* in December, 1917. The fol-

lowing extract is taken from a report made by Agent Fassett, who gave attention to them after they reached Washington early in 1918:

These shoulders were packed under the personal supervision of the writer, as follows: Because of the importance of keeping manual labor connected with by-products problems on the seal islands at a minimum, the shoulders were removed from the carcasses without especial care. The native foreman merely detailed a few young men to cut off enough shoulders to fill a barrel, and to send them to the salt house for packing. None of the blubber or fat, the sinews, and other parts which it is usual to remove very carefully when preparing seal meat for use on the officers' mess table, was bothered with; whatever was attached to a piece of meat was left there.

The shoulders were struck in dry salt, using it liberally, and a week later were removed, rinsed, drained, and repacked in the same manner first employed. They were then held in the salt house at a low temperature until a few days prior to shipment by the steamer *Roosevelt* (about Dec. 1, 1917), when they were again repacked in fresh salt. After receipt in Washington a saturated solution of salt and water (brine pickle) was poured over the contents of the barrel so as completely to cover the same.

On March 21, 1918, the writer, in the presence of Dr. Holmes, representing Dr. Langworthy, and Mr. W. T. Bower, of this Bureau, withdrew about a dozen shoulders from the barrel, laying them on a table. All appeared to be thoroughly cured and in "sweet" condition. From these two pieces were selected and sent to the office of Home Economics for testing. They were put into fresh water the same evening to dissolve excess salt, and at noon of the 23d were cooked by experts at the Home Economics office. Meat prepared after the manner of kidney stew, ordinary stew, and fried breakfast hash (with onions and potatoes) was found quite palatable. The samples cooked after the manner of ordinary corned beef, fried steak, and baked or roast meat were not so agreeable. The women who did the cooking could not be prevailed upon to eat of any of the meat, having conceived a disgust for it on account of the very disagreeable marine odor which it gave off while being prepared.

The writer found it possible to eat of each sample, but noted that none was equal to that which it is customary to serve on the St. Paul mess table, prepared from fresh seal meat which has been carefully stripped of all fatty matter, and disguised by sauces, aromatic herbs, and vegetables, larding of pork, bacon, etc.

After a discussion of the matter with Dr. H. F. Moore and Mr. W. T. Bower, the writer is inclined to think that seal shoulders prepared for shipment in the manner herein described will not find a market in the United States, chiefly on account of the very disagreeable marine odor and taste. It is possible that Asiatic Orientals, such as the poorer classes in China and Japan, might absorb a moderate quantity of seal shoulders packed in the manner described.

Canned meat.—In September, 1917, the Bureau directed the agent at St. Paul to ship samples of canned fur-seal meat. An apparatus for processing the meat preparatory to canning was sent to St. Paul Island, but was not landed there in time to permit the preparation of samples before the *Roosevelt* left the islands in December.

BRANDED SEALS.

As in previous years a number of male seals branded when pups in 1912 were killed in 1917. The skins of 25 of these seals killed on St. Paul Island and of 21 on St. George Island were shipped from the Pribilofs in the year. There were also shipped from St. Paul Island 18 skins taken on that island in September, October, and November, 1916, and from St. George Island 4 skins taken there in October and November, 1916, all from male seals which were branded when pups in 1912.

Certain data were secured in regard to the seals involved and to the skins after removal from the animals. A portion of the data for the skins was recorded at St. Louis in March, 1918. With the exception of the 4 seals killed on St. George Island in October and November, 1916, concerning which the data were very incomplete, certain records secured by the Bureau are shown in the following table:

DATA ON CERTAIN MALE SEALS KILLED, 1916 TO 1917, BRANDED AS PUPS IN 1912.

FOUR-YEAR-OLDS.

Serial No. of skins.	Date of killing.	Island.	Carcass weight.[a]	Carcass length.	Green skin weight.		Trade classification.
			Pounds.	*Inches.*	*Pounds.*	*Ounces.*	
P 12733....	Sept. 4, 1916	St. Paul...	91	51	9	....	Small seal.
P 12734....	......do........	...do.......	99	52	11	....	Do.
P 12735....	......do........	...do.......	127	56.25	12	8	Do.
P 12736....	......do........	...do.......	96	51	11	....	Do.
P 12737....	......do........	...do.......	77	49	9	8	Do.
P 12738....	......do........	...do.......	120	52.50	13	....	Middling.
P 12798....	Oct. 17, 1916	...do.......	125	54	13	8	Do.
P 12906....	Oct. 27, 1916	...do.......	109	54.50	11	....	Middling and small.
P 12907....	......do........	...do.......	111	52.25	13	....	Do.
P 12908....	......do........	...do.......	126	53	13	8	Middling.
P 12909....	......do........	...do.......	151	54.50	14	....	Do.
P 12910....	......do........	...do.......	117	53.50	13	....	Do.
P 12911....	......do........	...do.......	82	57.50	11	....	Do.
P 12912....	......do........	...do.......	115	54.50	12	....	Small seal.
P 13249....	Nov. 28, 1916	...do.......	143	59	17	8	Wig.
P 13250....	......do........	...do.......	128	58	14	....	Middling.
P 13251....	......do........	...do.......	124	57	13	....	Do.
P 13252....	......do........	...do.......	93	55	12	....	Do.

FIVE-YEAR-OLDS.

Serial No. of skins.	Date of killing.	Island.	Carcass weight. (Pounds)	Carcass length. (Inches)	Green skin weight. (Pounds)	Green skin weight. (Ounces)	Trade classification.
P 13341....	May 31, 1917	St. Paul...	110.25	56.25	12	8	Middling and small.
P 13376....	......do........	...do.......	103	53	11	12	Small seal.
P 13377....	......do........	...do.......	116.75	57.25	13	....	Middling.
P 13449....	June 11, 1917	...do.......	139.75	56	17	4	Do.
P 13450....	......do........	...do.......	115.25	51	11	12	Small seal.
P 13451....	......do........	...do.......	117.75	54.75	14	12	Middling.
P 13452....	......do........	...do.......	111.50	54.75	13	4	Middling and small.
P 13950....	June 30, 1917	...do.......	112	54.75	12	13	Middling.
P 13951....	......do........	...do.......	119.50	50	13	12	Do.
P 13952....	......do........	...do.......	101.50	49	11	8	Middling and small.
P 13953....	......do........	...do.......	112.50	51.50	15	....	Middling.
P 13954....	......do........	...do.......	152.50	55.50	20	4	Wig.
P 14279....	July 3, 1917	...do.......	111.25	55	13	3	Middling.
P 14562....	July 7, 1917	...do.......	129	57.75	14	9	Do.
P 14563....	......do........	...do.......	125.50	55.75	13	4	Middling and small.
P 15498....	July 11, 1917	...do.......	119	55	12	10	Do.
P 15499....	......do........	...do.......	110	53.50	12	8	Do.
AP 5759....	Aug. 1, 1917	...do.......	133	58	14	12	Middling.
AP 5760....	......do........	...do.......	105.50	53.75	13	15	Do.
AP 6065....	Aug. 4, 1917	...do.......	89	53.75	10	2	Small seal.
AP 6066....	......do........	...do.......	127	57.25	17	7	Middling.
AP 6067....	......do........	...do.......	127	59	17	8	Do.
AP 6449....	Oct. 22, 1917	...do.......	150.25	56.50	18	8	Wig.
AP 6451....	Oct. 25, 1917	...do.......	135.50	58	15	....	Middling.
AP 6452....	......do........	...do.......	166	59.50	19	4	Wig.
AP 6453....	Oct. 27, 1917	...do.......	162.50	58.75	18	12	Do.
G 5913.....	May 28, 1917	St. George.	133	55.25	15	2	Middling and small.
G 5914.....	......do........	...do.......	152	59	13	1	Wig.
G 5915.....	June 4, 1917	...do.......	102	53	11	12	Small seal.
G 5916.....	......do........	...do.......	134	59.50	14	12	Wig.
G 5919.....	June 30, 1917	...do.......	153	60	17	....	Do.
G 5921.....	July 6, 1917	...do.......	95	54.75	16	5	Small seal.
G 5922.....	July 7, 1917	...do.......	111	55.50	14	1	Middling.
G 5923.....	......do........	...do.......	74.38	55.25	10	12	Small seal.
G 5924.....	July 17, 1917	...do.......	140	60	17	2	Wig.
G 5925.....	......do........	...do.......	96	55	13	2	Middling.
G 5926.....	July 27, 1917	...do.......	106	54.25	15	....	Middling and small.
G 5927.....	......do........	...do.......	139	57.25	17	10	Do.
G 5928.....	Aug. 3, 1917	...do.......	104.50	55	16	8	Middling.
G 5929.....	Aug. 8, 1917	...do.......	103	58	15	6	Do.
G 5930.....	Aug. 10, 1917	...do.......	97.50	55.25	13	....	Middling and small.
G 5931.....	......do........	...do.......	133	56.75	16	....	Middling.
G 5994.....	Oct. 23, 1917	...do.......	109.75	57	20	12	Do.
G 5995.....	......do........	...do.......	144.50	62	22	8	Wig.
G 5996.....	......do........	...do.......	144.25	62.50	24	8	Do.
G 5997.....	......do........	...do.......	116.50	57.50	19	10	Middling.
G 5998.....	......do........	...do.......	123.50	62.75	20	14	Do.

[a] Seals were bled before being weighed.

CENSUS OF THE FUR-SEAL HERD.

A census of the fur-seal herd of the Pribilof Islands was again taken in 1917. The work was under the immediate charge of G. Dallas Hanna. He was assisted by other members of the Alaska service stationed on the Pribilof Islands, and by Dr. Harold Heath, of Stanford University. Transportation between St. Paul and St. George Islands was afforded by the Coast Guard cutter *Unalga* and by the Fisheries steamer *Roosevelt*.

The increased size of the herd, together with the relatively much greater increase in the number of male seals, made the work more difficult than in any previous year and radical changes in methods of procedure were necessary.

For the purpose of showing the numerical strength of the herd in 1917 as compared with the five preceding years, the following table of recent censuses of the herd is given:

GENERAL COMPARISON OF RECENT CENSUSES OF THE SEAL HERD.

Class of seals.	1912	1913	1914	1915	1916	1917
Harem bulls	1,358	1,403	1,559	2,151	3,500	4,850
Breeding cows	81,984	92,269	93,250	103,527	116,977	128,024
Surplus bulls						8,977
Idle bulls	113	105	172	673	2,632	2,706
Young bulls (chiefly 5-year olds)	199	259	1,658			
6-year-old males					11,167	15,397
5-year-old males				11,271	15,494	14,813
4-year-old males	100	2,000	9,939	15,848	15,427	16,631
3-year-old males	2,000	10,000	13,880	18,282	19,402	19,507
2-year-old males	11,000	15,000	17,422	23,990	24,169	26,815
Yearling males	13,000	20,000	23,068	30,307	33,645	38,013
2-year-old cows	11,000	15,000	17,422	23,990	24,245	26,917
Yearling cows	13,000	20,000	23,067	30,306	33,646	38,018
Pups	81,984	92,269	93,250	103,527	116,977	128,024
Total	215,738	268,305	294,687	363,872	417,281	468,692

The report submitted by Mr. Hanna considers various phases of the problems connected with the management of the herd in addition to the details of the census. Data in regard to the census are published in another section of this report.

FOXES.

The taking of fox pelts in the season of 1917–18 for commercial purposes was begun on both St. Paul and St. George Islands in December, 1917. The take on both islands for the season, including a few skins from animals found dead at various times, consisted of 692 blue pelts and 19 white pelts. Information in regard to the operations has been transmitted by radio and is necessarily limited to the more important facts.

St. Paul Island.—In the week ending December 31, 1917, 74 blue pelts and 8 white pelts were taken, and in January, 1918, the take consisted of 15 blues and 6 whites. A skin secured in April, 1918, from a blue fox found dead may properly be considered a part of the season's take, inasmuch as it became available for shipment with the others. This makes the total for the season 90 blues and 14 whites.

In the season of 1916–17 there were taken on St. Paul Island 150 blue pelts and 37 white pelts (including one of each taken from foxes

found dead in February, 1917). In the season of 1915–16 the take on this island was 211 blue and 17 white pelts (including 1 white pelt taken in February, 1916, from a fox found dead). It will be noted that the take in the 1917–18 season was considerably less than that of either of the two preceding seasons, the decline from the season of 1915–16 being more than 50 per cent. This small take was made in the face of favorable weather conditions and an increase in the number of traps used. The natives, who receive $5 for each fox pelt taken, requested that a brief close season be established for the island. The solution of the problem of maintaining on this island a fox herd of a size in keeping with the possibilities probably lies in the adoption of the plan of feeding the foxes for a portion of the year.

St. George Island.—In December, 1917, 330 pelts were taken on St. George Island, fox killings having been begun about the middle of the month; in January, 1918, 225 pelts; and in February, 1918, 49 pelts. Including two pelts taken from foxes found dead in November, 1917, and one from an animal found dead in March, 1918, the take for the season of 1917–18 consisted of 602 blue pelts and 5 white pelts. Continued cold weather made it practicable to continue the taking of pelts until February 8. During the season 200 pairs of foxes were captured, marked, and released as breeders. Many foxes not marked also remained on the island augmenting the reserve. The herd was in fine physical condition, and it is believed that the take of pelts will prove to be of a high grade.

REINDEER.

On May 19, 1917, there were counted on St. Paul Island 105 adult reindeer and 39 fawns, a total of 144 animals.

On St. George Island the herd on June 30, 1917, consisted of 70 animals aged 1 year and upward and 26 fawns, a total of 96. Three adult males were later killed for food purposes.

The various activities which have been initiated on the Pribilofs recently, coupled with the small force of employees available, made it impracticable to give as much attention to the utilization and development of the reindeer as was desired. However, the herds are able to maintain themselves, are of no expense, do not materially exhaust the resources of the island, and will be available for more intensive care and utilization when circumstances permit.

RADIO SERVICE.

The Navy Department kept the radio stations on St. Paul and St. George Islands in commission throughout the year. The services which these stations render to the Bureau's work in affording a prompt means of communication with the islands are invaluable. Cooperation between the personnel of the Bureau of Fisheries and that of the radio service is mutual and of unquestioned value to both services.

PATROL OF THE NORTH PACIFIC OCEAN AND BERING SEA.

The act of Congress, approved August 24, 1912, giving effect to the North Pacific Sealing Convention of July 7, 1911, provides, "that it shall be the duty of the President to cause a guard or patrol

to be maintained in the waters frequented by the seal herd or herds and sea otter, in the protection of which the United States is especially interested, composed of naval or other public vessels of the United States designated by him for such service."

The vessels of the Coast Guard are particularly well fitted for the required patrol work and the personnel of the service is thoroughly familiar with the conditions which obtain in the waters to be guarded. For these reasons vessels of the Coast Guard have been utilized exclusively for this work.

The following is a statement prepared by the Coast Guard, describing briefly the character of the patrol work for the season of 1917:

MEMORANDUM CONCERNING OPERATIONS OF THE COAST GUARD IN CONNECTION WITH PATROLLING THE NORTH PACIFIC AND BERING SEA, FOR PROTECTION OF SEALS AND SEA OTTERS, DURING THE SEASON OF 1917.

Owing to war conditions but one cutter, the *Unalga*, was detailed for this patrol in 1917. That vessel left Seattle on May 3, 1917, for Alaskan waters. She took on board at her port of departure a number of sacks of mail for Unalaska and the Pribilof Islands. Three agents of the Bureau of Fisheries were also taken on board for transportation to Unalaska and St. George Island.

On her way north light variable breezes to a fresh southeast gale with thick weather were encountered. An average distance of 18 to 20 miles offshore was maintained and a sharp lookout for fur seals was kept, but no seals were sighted. A stop was made at Sitka, and the voyage resumed on May 9 along the Alaskan peninsula, continuing the lookout for fur seals, but none was seen. A call was made at Kodiak, and then the trip to the westward was resumed, skirting in and around the various islands on the lookout for seals. As weather permitted, patrolled the waters between the Barren Islands and Pearl Island. Arrived at Unalaska on May 29. On June 4 took on board officials, mail, stores, etc. June 7 arrived off the village, St. George Island. On June 8 proceeded to St. Paul Island. After cruising around the islands, returned to Unalaska on June 9, and delivered the mail from the Pribilof Islands for the States.

June 16 sailed for Atka and Attu, and cruised around the Aleutian Islands, stopping at such places as were necessary for rendering assistance to vessels in distress. On June 29 returned to Unalaska.

July 7 left Unalaska on a cruise for Seward and Valdez, calling at several ports en route and continuing the patrol. Performed numerous duties for other departments of the Government at such times as most convenient and desirable, and returned to Unalaska on August 19. Left latter port on August 20 and made another cruise as far as Nazan Bay, off Atka. After making a thorough search in the bays and around the islands of the Aleutian chain, returned to Unalaska on September 5. On September 12, the services of the vessel being no longer required on patrol duty, started for the States, stopping en route at Akutan, Valdez, Bear Bay, Ketchikan, and Point Colpoys, arriving at Seattle on October 1.

During the entire season the *Unalga* steamed a total of 12,892.3 miles, boarding 33 vessels and assisting 3.

Along with the patrol work the Coast Guard each year renders invaluable assistance to the Bureau in the way of transporting employees, mail, and supplies, acknowledgment for which is here made.

From time to time the Coast Guard also cooperates in enforcing the fisheries laws at isolated points along the Alaskan coast. Work of this kind is usually done in connection with the performance of the regular duties of that service.

SEALING PRIVILEGES ACCORDED ABORIGINES.

The North Pacific Sealing Convention of July 7, 1911, provided that Indians, Aleuts, or other aborigines dwelling on the Pacific coast of North America north of the thirtieth parallel of north latitude might carry on pelagic sealing in canoes not transported by or used in connection with other vessels, and propelled entirely by oars, paddles, or sails, and manned by not more than five persons each,

in the way hitherto practiced and without the use of firearms; and provided that such aborigines are not in the employment of other persons, or under contract to deliver the skins to any person. However, section 4 of the act of April 21, 1910 (36 Stat., 326), prohibits the killing of fur seals together with other fur-bearing animals within the limits of Alaska Territory or in the waters thereof, and empowers the Secretary of Commerce "to authorize the killing of any such * * * fur seal, * * * under such regulations as he may prescribe." The Secretary of Commerce has not exercised the power granted by this latter provision; so, at the present time under the provisions of this statute the killing of fur seals within the Territory of Alaska or in the waters thereof is absolutely prohibited. For the purposes of this act the waters of Alaska extend offshore to the 3-mile limit.

The act approved August 24, 1912, giving effect to the North Pacific Sealing Convention forbids bringing into the United States any skins taken from seals belonging to the American fur-seal herd of the North Pacific Ocean unless they are officially marked and certified as having been legally taken. Indians or other aborigines subject to the jurisdiction of the United States should make prompt application to the Commissioner of Fisheries or to a representative of the Bureau of Fisheries for the marking and authentication of any fur-seal skins lawfully taken by them.

In May, 1917, two fur seals were taken by a native of Sitka, Alaska, off Biorka Island, outside the 3-mile limit. It was reported that both were males. The skins obtained were subsequently authenticated by a representative of the Bureau.

Through the courtesy of the Department of the Interior, Dr. C. L. Woods, superintendent and physician, United States Indian Service, Neah Bay, Wash., authenticated sealskins legally taken by Indians in the coastal waters off the State of Washington. Reports submitted by Dr. Woods indicate that 517 skins taken in 1917 were authenticated by him. The skins were taken in the months of May and June. With the exception of five taken west of Ozette, all were secured 20 or 25 miles west of La Push. The seals from which the skins were taken were speared from canoes. The records indicated that 209 were males, 304 females, sex undetermined in respect to 4 pups.

SHIPMENTS OF SKINS FROM PRIBILOF ISLANDS IN 1917.

Fur-seal skins.—On July 30 there were placed aboard the steamer *Roosevelt* at the Pribilofs 2,823 St. Paul skins and on August 1, 2,059 St. George skins. These skins, 4,882 in number, were delivered at Seattle by the *Roosevelt* August 18. They were then shipped August 19 by freight consigned to Funsten Bros. & Co., St. Louis, Mo. The shipment left Seattle via the Northern Pacific Railway Co., and was delivered at St. Louis early in September.

A second shipment of fur-seal skins from the Pribilofs in 1917 was made in December. This shipment consisted of 1,630 St. George skins and 2,628 taken on St. Paul Island, a total of 4,258 skins. This shipment was also made on the *Roosevelt*, which arrived with them at Seattle on January 14, 1918. The skins were reshipped at Seattle January 15 via the Northern Pacific Railway, consigned to Funsten Bros. & Co., and were delivered at St. Louis in February.

Fox skins.—The fox skins taken at the Pribilofs in the season of 1916–17 were placed aboard the *Roosevelt* July 30–31 and were delivered by the vessel at Seattle August 18. The skins were reshipped the same day, consigned to Funsten Bros. & Cc , St. Louis, via Wells, Fargo & Co. Express. The shipment consisted of 150 blue pelts and 37 white pelts from St. Paul Island and 417 blues and 2 whites from St. George Island; a total of 567 blues and 39 whites, making a grand total of 606 skins.

SALES OF FUR-SEAL SKINS.

Three sales of fur-seal skins from the Pribilof Islands were held at St. Louis, Mo., by Funsten Bros. & Co. in the calendar year 1917. The skins were sold at auction to the highest bidders. The dates of the sales were January 29, April 18, and October 8, respectively. The total number of skins sold was 6,739, all of which had previously been dressed, dyed, and machined.

At the sale on January 29, 1917, the number of skins sold was 2,000. They brought $93,678 gross, an average of $46.84 per skin. For the purposes of the sale the 2,000 skins were divided into 30 lots. The highest prices obtained were for a lot of 33 skins, which brought $1,980, an average of $60 per skin. The minimum price obtained for any pelt was $25. The following table shows details in regard to the sale:

Details of Sale of 2,000 Dressed, Dyed, and Machined Pribilof Islands Fur-Seal Skins at St. Louis, Jan. 29, 1917.

Lot No.	Number of skins.	Trade classification.	Price per skin.	Total for lot.
3505	33	12 middlings; 21 middlings and smalls	$60	$1,980
3506	50	Middlings and smalls	56	2,800
3507	70	Smalls	50	3,500
3508	70	do	50	3,500
3509	70	do	50	3,500
3510	70	do	53	3,710
3511	70	do	55	3,850
3512	41	do	55	2,255
3513	80	Large pups	47	3,760
3514	80	do	49	3,920
3515	80	do	48	3,840
3516	80	do	48	3,840
3517	80	do	48	3,840
3518	80	do	48	3,840
3519	80	do	48	3,840
3520	80	do	48	3,840
3521	80	do	47	3,760
3522	46	do	47	2,162
3323	45	do	49	2,205
3524	90	Middling pups	42	3,780
3525	90	do	43	3,870
3526	90	do	45	4,050
3527	90	do	43	3,870
3528	90	do	43	3,870
3529	51	do	45	2,295
3530	50	do	44	2,200
3531	42	Small pups	40	1,680
3532	35	III: 1 middling and small 7 smalls 13 large pups 13 middling pups 1 small pup	25	875
3533	36	III: 2 middlings and smalls 7 smalls 14 large pups 12 middling pups 1 small pup	25	900
3534	51	Cuts, etc.: 3 middlings and smalls 7 smalls 22 large pups 16 middling pups 3 small pups	46	2,346
Total	2,000			93,678

The following table shows a summary of the trade classifications and the percentage of the total number in each class:

SUMMARY OF TRADE CLASSIFICATIONS AND PERCENTAGE IN EACH CLASS OF THE FUR-SEAL SKINS SOLD AT ST. LOUIS, JAN. 29, 1917.

Trade classification.	Number in class.	Percentage.
Small pups	47	2.35
Middling pups	592	29.60
Large pups	860	43.00
Smalls	412	20.60
Middlings and smalls	77	3.85
Middlings	12	.60
Total	2,000	100.00

At the second sale in 1917, held on April 18, the number of skins sold was 1,500. These skins brought $68,540.50 gross, an average of $45.69 per skin. The maximum price per skin was $60 and the minimum $22.50. The following table shows details in regard to the sale:

DETAILS OF SALE OF 1,500 DRESSED, DYED, AND MACHINED PRIBILOF ISLANDS FUR-SEAL SKINS AT ST. LOUIS, APRIL 18, 1917.

Lot No.	Number of skins.	Trade classification.	Price per skin.	Total for lot.
11100	56	30 middlings 26 middlings and smalls	$60.00	$3,360.00
11101	70	Middlings and smalls	50.00	3,500.00
11102	80	Smalls	49.00	3,920.00
11103	80	do	52.00	4,160.00
11104	71	do	48.00	3,408.00
11105	80	Large pups	51.00	4,080.00
11106	80	do	50.00	4,000.00
11107	80	do	47.00	3,760.00
11108	80	do	47.00	3,760.00
11109	80	do	51.00	4,080.00
11110	90	Middling pups	43.00	3,870.00
11111	90	do	42.00	3,780.00
11112	80	do	40.00	3,200.00
11113	75	Cuts, etc.: 3 middlings 6 middlings and smalls 18 smalls 24 large pups 23 middling pups 1 small pup	42.00	3,150.00
11114	75	do: 2 middlings 7 middlings and smalls 18 smalls 24 large pups 23 middling pups 1 small pup	41.00	3,075.00
11115	60	III: 2 middlings 7 middlings and smalls 20 smalls 22 large pups 9 middling pups	25.50	1,530.00
11116	59	III: 2 middlings 6 middlings and smalls 20 smalls 21 large pups 9 middling pups 1 small pup	22.50	1,327.50
11117	24	3 middlings 21 middlings and smalls	57.00	1,368.00
11118	63	Smalls	55.00	3,465.00
11119	68	Large pups	48.00	3,264.00
11120	33	Middling pups	39.00	1,287.00
11121	26	Cuts, etc.: 11 smalls 15 large pups	46.00	1,196.00
Total	1,500			68,540.50

The following table shows a summary of the trade classifications and the percentage of the total number in each class:

SUMMARY OF TRADE CLASSIFICATIONS AND PERCENTAGE IN EACH CLASS OF THE FUR-SEAL SKINS SOLD AT ST. LOUIS, APRIL 18, 1917.

Trade classification.	Number in class.	Percentage.
Small pups	3	0.2
Middling pups	357	23.8
Large pups	574	38.26
Smalls	381	25.4
Middlings and smalls	143	9.54
Middlings	42	2.8
Total	1,500	100.00

At the third sale in 1917, held October 8, the number of skins sold was 3,239. These skins brought $107,447 gross, averaging $33.17 each. The following table shows details in regard to the sale:

DETAILS OF SALE OF 3,239 DRESSED, DYED, AND MACHINED PRIBILOF ISLANDS FUR-SEAL SKINS AT ST. LOUIS OCT. 8, 1917.

Lot No.	Number of skins.	Classification.	Price per skin.	Total for lot.
1	65	{10 wigs 55 middlings}	$43.00	$2,795.00
2	50	Middlings and smalls	42.00	2,100.00
3	50	do	45.00	2,250.00
4	50	do	41.50	2,075.00
5	50	do	42.50	2,125.00
6	50	do	41.50	2,075.00
7	80	Smalls	33.50	2,680.00
8	80	do	38.50	3,080.00
9	80	do	34.50	2,760.00
10	80	do	39.00	3,120.00
11	80	do	34.50	2,760.00
12	80	do	37.50	3,000.00
13	80	do	35.00	2,800.00
14	80	do	33.00	2,640.00
15	80	do	32.50	2,600.00
16	80	do	34.00	2,720.00
17	43	do	30.00	1,290.00
18	80	Large pups	28.50	2,280.00
19	80	do	35.50	2,840.00
20	80	do	34.00	2,720.00
21	80	do	33.50	2,680.00
22	80	do	36.00	2,880.00
23	80	do	34.00	2,720.00
24	80	do	35.00	2,800.00
25	80	do	32.00	2,560.00
26	80	do	34.00	2,720.00
27	80	do	34.50	2,760.00
28	80	do	35.50	2,840.00
29	80	do	37.00	2,960.00
30	80	do	38.00	3,040.00
31	91	do	31.50	2,866.50
32	80	Middling pups	32.50	2,600.00
33	80	do	32.00	2,560.00
34	80	do	30.00	2,400.00
35	80	do	32.50	2,600.00
36	80	do	32.50	2,600.00
37	80	do	34.50	2,760.00
38	109	do	31.00	3,379.00
39	61	Small pups	32.00	1,952.00
40	65	Faulty: {2 middlings and smalls 9 smalls 24 large pups 18 middling pups 12 small pups}	23.50	1,527.50

DETAILS OF SALE OF 3,239 DRESSED, DYED, AND MACHINED PRIBILOF ISLANDS FUR-SEAL SKINS AT ST. LOUIS OCT. 8, 1917—Continued.

Lot No.	Number of skins.	Classification.	Price per skin.	Total for lot.
41	48	III.. 4 middlings and smalls; 15 smalls; 29 large pups	$18.50	$888.00
42	62	III.. 54 middling pups; 8 small pups	17.00	1,054.00
43	45	IV.. 1 middling; 11 smalls; 33 large pups	14.00	630.00
43½	80	IV.. 50 middling pups; 28 small pups; 2 extra small pups	12.00	960.00
Total	3,239			107,447.00

The following table shows a summary of the size classifications and the percentage of the total number in each class:

SUMMARY OF SIZE CLASSIFICATIONS AND PERCENTAGE IN EACH CLASS OF THE FUR-SEAL SKINS SOLD AT ST. LOUIS OCT. 8, 1917.

Trade classification.	Number in class.	Percentage.
Extra small pups	2	0.06
Small pups	109	3.37
Middling pups	711	21.95
Large pups	1,217	37.57
Smalls	878	27.11
Middlings and smalls	256	7.91
Middlings	56	1.73
Wigs	10	.30
Total	3,239	100.00

The number of fur-seal skins from the Pribilof Islands on hand in the States on December 31, 1916, was 11,457. Forty-eight hundred and eighty-two skins were received from the Pribilofs in 1917. The aggregate number of skins sold in 1917 was 6,739. The number of fur-seal skins from the Pribilof Islands on hand in the States on December 31, 1917, was, therefore, 9,600. In this connection it should be noted that on December 31, 1917, there were 4,258 additional skins aboard the steamer *Roosevelt* en route from the Pribilofs to Seattle.

SALE OF FOX SKINS.

The fox skins shipped from St. Paul and St. George Islands in 1917 were sold at St. Louis by Funsten Bros. & Co. on October 8, 1917. The 567 blue-fox skins brought $34,653.50 gross, averaging $61.11 each; the 39 white-fox skins $1,027 gross, averaging $26.33 each. The following table shows details in regard to the sale of these skins.

DETAILS OF SALE OF 567 BLUE-FOX SKINS AND 39 WHITE-FOX SKINS FROM PRIBILOF ISLANDS AT ST. LOUIS, OCT. 8, 1917.

Lot No.	Number of skins.	Trade classification.	Price per skin.	Total for lot.
Blue-fox skins:				
79	6	Extra fine dark	$101.00	$606.00
80	9	Fine dark	93.00	837.00
81	4	I extra large dark	97.00	388.00
82	8	I and II extra large dark	79.00	632.00
83	8	I dark	87.00	696.00
84	10	II dark	77.00	770.00
85	12	II dark low	59.00	708.00
86	12	do	58.00	696.00
87	16	III dark	42.00	672.00
88	12	I blue	73.00	876.00
89	12	do	74.00	888.00
90	8	II extra large blue	72.00	576.00
91	10	II blue	61.00	610.00
92	10	do	63.00	630.00
93	12	II blue low	52.00	624.00
94	12	do	71.00	852.00
95	12	III blue	30.00	360.00
96	10	I pale	60.00	600.00
97	8	II pale	44.00	352.00
98	10	II pale low	36.00	360.00
99	10	III pale	31.00	310.00
100	14	IV	18.00	252.00
101	10	I and II	75.00	750.00
102	4	Extra fine dark	142.00	568.00
103	4	do	117.00	468.00
104	4	do	111.00	444.00
105	4	Extra large fine dark	115.00	460.00
106	9	Fine dark	93.00	837.00
107	4	I extra large dark	96.00	384.00
108	12	I dark	85.00	1,020.00
109	7	I dark point silver	88.00	616.00
110	10	II dark	78.00	780.00
111	8	do	66.00	528.00
112	14	II dark low	60.00	840.00
113	10	I blue	79.00	790.00
114	6	II extra large blue	69.00	414.00
115	12	II blue	52.00	624.00
116	10	II blue low	54.00	540.00
117	14	III blue	41.00	574.00
118	6	I pale	52.50	315.00
119	9	II pale	47.00	423.00
120	13	IV	17.50	227.50
121	8	I and II	79.00	632.00
122	4	Extra fine dark	107.00	428.00
123	9	Fine dark	98.00	882.00
124	4	I extra large fine dark	101.00	404.00
125	10	I dark	90.00	900.00
126	8	I and II extra large dark	72.00	576.00
127	10	II dark	79.00	790.00
128	12	II dark low	62.00	744.00
129	16	III dark	38.00	608.00
130	12	I blue	68.00	816.00
131	8	II extra large blue	53.00	424.00
132	10	II blue	54.00	540.00
133	13	II blue low	51.00	663.00
134	14	III blue	27.00	378.00
135	9	I pale	62.00	558.00
136	6	II pale	51.00	306.00
137	16	IV	6.50	104.00
138	3	Skins	1.00	3.00
White-fox skins:				
730	11	I	31.00	341.00
731	14	II	28.50	399.00
732	14	{13 I and II stained {1 III	20.50	287.00
Total	606			35,680.50

FUR-SEAL CENSUS, PRIBILOF ISLANDS, 1917.

By G. Dallas Hanna.

SCOPE OF 1917 CENSUS.

In each of the five summers preceding that of 1917 a complete census was taken of the fur seals resorting to the Pribilof Islands in so far as this was possible, that is, all the adult males and all the young of the season were actually counted. On account of the large influx of male seals resulting from the cessation of commercial killing each succeeding census was marked by increased difficulties.

In 1916 it was barely possible to count all the pups with the force available. While a complete pup count could not be made in 1917, a sufficient proportion of the pups was enumerated to establish good averages which were applicable to the remainder. The 1917 census is therefore entirely comparable with the five preceding ones, and owing to its greater detail probably second to none in accuracy taken previous to 1912.

The rookery rocks which were numbered and marked with white paint by the Coast and Geodetic Survey in 1897 were repainted and relocated where necessary. This work was carried as nearly to completion as possible. The photographic stations occupied by the 1895 investigation were relocated and marked with paint. All these data were plotted on Coast Survey charts.

At the height of the breeding season harem bulls and idle bulls were counted on all the rookeries on St. George and St. Paul Islands. Hauling-ground seals were estimated at the same time. The breeding areas were carefully plotted on Coast Survey charts at this time. A complete series of photographs was taken from the historical stations of 1895.

After the height of the breeding season was over and the bulls had lost much of their viciousness, but before the pups had learned to swim, the latter were counted on eight rookeries on St. Paul Island and on three rookeries on St. George Island.

From these data obtained in the above-described field work a computation of the entire number of seals was made. The computation was intended to be complete to August 10, 1917.

HABITS OF FUR SEALS.

To begin an account of the fur-seal herd as it now exists it is necessary to outline briefly the important facts in its life history which have a direct bearing upon the methods of study pursued. Complete accounts have been published many times in the past and are readily accessible.

The mature females or cows arrive at the islands mostly between June 15 and July 15 and give birth to one young from a few hours to a few days after coming ashore. Cows have been seen as early as

May 26 and newborn young have been seen in September. The adult males, called bulls, are all in position when the cows come and dot the breeding ground checker-board fashion. The cow seems to have no choice of a rookery nor to any great extent of a bull. When she is ready to land she ventures out shyly but a short distance at first and is intercepted by one of the water-line tier of bulls. She then slips from one bull to another back up through the breeding area toward the rear. Probably this is mostly done at night, but it is commonly observed in the day. After she finally becomes settled she lies down quietly to sleep.

The newborn pup is jet black and weighs 10 to 12 pounds. Its eyes are open and it moves around within 15 minutes usually. The mother cares little for it, as a rule. She has been seen to lift it out of crevices of rocks and out of the way of the bull as he stampedes across the harem area. When very young the mother will often stand by it against man. But after she once returns to the water and again comes back she will desert the pup on the slightest provocation.

Pups begin to swim in the first half of August while their hair is still black, but not until they have completely shed the milk dentition. Soon after taking to the water they begin to shed the black hair and by the end of September it has been replaced on most of them by a coat of glistening silvery gray. They then swim farther and farther from the parent rookery and eventually cruise, in schools, completely around the islands. But they return to land periodically, probably to the parent rookery in every case, where the mothers come to meet them. Here they nurse and upon the rich milk they get exceedingly fat. They have not been known to feed upon anything except milk before they leave the islands for the winter migration. Before they depart many weigh more than 50 pounds. In November they go south through the Aleutian passes.

Each cow weighs 50 to 100 pounds and is of the same color as the males, 2, 3, and 4 years old, as well as of the same size. Their whiskers are black the first three years, but begin to turn white in the fourth year. Thus they are very difficult to distinguish from the bachelors.

The bulls are very much larger than the cows. They weigh 400 or 500 pounds and are usually of a rusty red color. They have a bristly mane about 2 inches long on the back of the neck and are vicious and ugly in disposition. They arrive at the islands from the end of April to the height of the breeding season. Here they soon haul out and get into position to await the coming of the cows. Some of them have to wait two or three weeks and some do not get cows at all. They establish themselves on an average of 18 feet apart and remain on their small plats, called harem areas, without food or drink until August 1 or later. During this time they live on a thick layer of blubber with which they are covered when they arrive. Before leaving they become very thin. Much sparring and bluffing take place between neighbors and occasionally there is a fight to the finish, in which the loser is driven to sea.

Cows quietly and gradually slip into the rookeries thus fully occupied by bulls. But there are not enough to make each harem of full capacity for every bull. Therefore the harems around the rear margins are usually very small, containing only one or a few cows,

while the centrally located bulls regularly get 75 or more in many cases.

Back of the line where the last cows extend there are still more bulls in position to which no cows come. These are called idle bulls. Then there are roaming bands of younger males here and there back of the idle bull lines.

At the ends or in the middle of all the larger rookeries, paths are left open in the breeding masses of seals for the young males, called bachelors, to haul up to the rear of the rookeries on the plats, called hauling grounds. The bulls never permit the bachelors to mingle with the cows nor even to pass through the rookery elsewhere than the regular runway.

These bachelors are composed of males 2 to 6 years old. They haul back on land to rest, sleep, and play for a week or more, then go to sea to feed. Some old bulls also haul out on the hauling grounds, especially those that have been severely injured on the rookeries. Also, after August 1, an occasional yearling comes out on the hauling grounds.

The yearlings, as a class, arrive at the islands after August 15. They scout the margins of the rookeries only and play with the pups, which are then just learning to swim. The yearlings are very small and thin as a rule; in fact, many weigh less than when they left the islands in the previous November. There is considerable variation in the coloration of all classes and ages of seals, but the yearlings do not differ as a rule from the 2-year-olds in this respect. Females and males are alike externally, and together play with the pups.

After August 1 the rigid harem discipline is relaxed, the pups begin to "pod" back of the rookeries as well as swim, and the cows follow them. Then by August 15 there is a general prowling over the rookeries by young bulls and many cows resort to the hauling grounds to play and sleep. The breeding heat has then practically passed for males as well as females. Some 2-year-old cows only remain to be impregnated, and these are served by the younger bulls roaming over the breeding grounds. The 2-year-old cows arrive late in the breeding season after most of the others have given birth to their pups.

The hauling-ground seals are the important ones commercially. They are practically all males in June and July. They occupy areas of their own and can be driven like sheep to a selected spot for killing without any disturbance of the breeding classes. The older ages come first in the spring, and killings can usually be made in the latter part of May. The 2-year-olds, the smallest of the lot, do not arrive in large numbers until after July 1.

THE PUPS.

The count of pups used to begin on July 26. This was attended with some difficulty owing to the presence of bulls, cows in heat, and newborn young, but no serious obstacles were encountered. In 1916 the large influx of bulls made it necessary to defer some of the counting as late as August 15. This is objectionable because some of the pups are swimming on that date and the number in the water must be estimated. It is highly desirable, therefore, to complete all pup counting before that date.

In 1917 the count was started on August 2, the first day it was practicable to enter the rookeries without danger to human life, and by the 9th so many pups had taken to the water that further counting was omitted. Results which would have been obtained thereafter would have had such a percentage of error due to the swimming pups that they would have been much less satisfactory than actual counts earlier in the season.

In all, eight of the St. Paul and three of the St. George rookeries were counted entirely and the dead on two other rookeries on St. Paul Island were carefully counted. The figures give a good basis for ascertaining the average harem on those rookeries which were not counted, and have been so used. Results are shown in the tables following:

DISTRIBUTION OF PUPS AT THE PRIBILOF ISLANDS IN 1917.

Rookery.	Date of counts.	Living pups.	Dead pups.	Total pups.
ST. PAUL ISLAND.				
Kitovi		a 2,482	a 38	2,520
Lukanin	Aug. 3	2,174	61	2,235
Gorbatch		a 8,346	a 303	8,649
Ardiguen		a 713	a 13	726
Reef	Aug. 7	16,985	457	17,442
Sivutch		a 4,933	a 127	5,060
Lagoon	Aug. 2	461	5	466
Tolstoi		a 15,085	a 348	15,433
Zapadni	Aug. 6	9,567	261	9,828
Little Zapadni		a 6,640	a 223	6,863
Zapadni Reef	Aug. 6	348	10	358
Polovina	Aug. 9	4,753	165	4,918
Polovina Cliffs	do	1,707	54	1,761
Little Polovina	do	1,245	15	1,260
Morjovi		a 2,824	97	2,921
Vostochni		a 26,989	1,260	28,249
Total		105,252	3,437	108,689
ST. GEORGE ISLAND.				
North		a 6,614	a 169	6,783
Staraya Artil		a 5,530	a 112	5,642
Zapadni	Aug. 6	1,033	17	1,050
South	do	24		24
East Reef	Aug. 4	1,762	24	1,786
East Cliffs		a 3,959	a 91	4,050
Total		18,922	413	19,335
Total, both islands		124,174	3,850	128,024

a Estimated.

PERCENTAGE OF INCREASE OR DECREASE IN THE NUMBER OF PUPS IN 1917 FROM 1916.

Rookery.	Total pups 1916.	Total pups, 1917.	Percentage of increase (+) or decrease (−).
ST. PAUL ISLAND.			
Kitovi	2,472	[a] 2,520	[b] + 1.94
Lukanin	2,141	2,235	+ 4.39
Gorbatch	8,864	[a] 8,649	[b] − 2.49
Ardiguen	700	[a] 726	[b] + 3.71
Reef	16,331	17,442	+ 6.80
Sivutch	5,020	[a] 5,060	[b] + .79
Lagoon	388	466	+20.10
Tolstoi	12,065	[a] 15,433	[b] +27.91
Zapadni	9,682	9,828	+ 1.51
Little Zapadni	6,277	[a] 6,863	[b] + 9.35
Zapadni Reef	266	358	+34.58
Polovina	4,744	4,918	+ 3.66
Polovina Cliffs	1,683	1,761	+ 4.63
Little Polovina	1,074	1,260	+17.31
Morjovi	2,761	[a] 2,921	[b] + 5.79
Vostochni	24,387	[a] 28,249	[b] +15.83
Total	98,855	108,689	+ 9.94
ST. GEORGE ISLAND.			
North	6,246	[a] 6,783	[b] + 8.50
Staraya Artil	5,545	[a] 5,642	[b] + 1.74
Zapadni	965	1,050	+ 8.80
South	19	24	+26.31
East Reef	1,585	1,786	+12.68
East Cliffs	3,762	[a] 4,050	[b] + 7.65
Total	18,122	19,335	+ 6.69
Total, both islands	116,977	128,024	+ 9.44

[a] Estimated. [b] Based on estimated number of pups in 1917.

PERCENTAGE OF ANNUAL INCREASE OF PUPS, 1912–1917.

Year.	Number of pups.	Percentage of increase.
1912	81,984	....
1913	92,269	12.54
1914	93,250	1.06
1915	103,527	11.02
1916	116,977	12.99
1917	128,024	9.44

It will be noted that the percentage of increase of pups for the herd is 9.44. The difference in the increase on the two islands may appear strange, but is entirely in accord with the facts gathered through six years of counting, and conforms to the general law of fur seals that their instincts cause them to flock to the centers of greater numbers, and the smallest rookeries grow most slowly.

This increase of 9.44 per cent is below what is generally believed to be the normal of 11 per cent. We see a reason for this in the lean year of 1914. Female pups born then gave birth to their first pups in 1917. Therefore the small increase in 1914 should be felt in 1917. Another factor which goes to make a small increase may be somewhat noticeable this year. This is the death rate of cows on land. In 1913, 1914, and 1915 the number of dead cows noted during the count on the rookeries was considered negligible. But in 1916 there was a

large increase in the percentage and again in 1917. This, however, was foreseen by all students of the subject. With an increase of bulls and the reduction of the average harem there must of necessity be an increase in the dead and injured cows in the harems.

The increased death rate of pups, due to the increase of bulls in 1916, can not be felt as a decrease of births until 1919 and should be most noticeable in 1920 when the results of the minimum average harem of 1917 will show. The increased death rate of pups on land due to any cause is certain to show as a decrease in births three years later. Of course the large size of the herd might make it almost imperceptible in a single year, when complete rookery observations are impossible, but the results are there and cumulative and can not be ignored.

During the count careful lookout was kept for signs of mange, uncinaria, etc. The mange appeared in 1914 to a noticeable extent, reached a maximum in 1915, and has grown less and less since. At the present time no serious trouble can be foreseen from this source because the percentage of seals afflicted is negligible. Mange affects the adults as well as the young and usually appears as round spots on the back. Here the guard hairs fall out, exposing the light-brown underfur. Such spots have been known to the trade as "rubbed places," but no rubbing action, such as would produce them, is possible by the fur seal.

As a result of the counting done two pups, both on St. Paul, were lost. One was smothered in a pod and the other was killed by a bull.

DEAD PUPS.

The increase in the percentage of dead pups keeps pace with the reduction of the average harem and the increase of bulls. As the bulls increase and get closer together on the rookery areas, there is more fighting and charging back and forth over the pups so that the number of dead will increase proportionately. Thus it has now become 3.01 per cent of the total, whereas it was under 2 per cent in 1914, when the average harem was treble what is found on many rookeries at present.

Still no very alarming results can be foreseen from the present death rate on land. Of course the loss of females is cumulative and important for that reason. By keeping the average harem at a minimum, and it has doubtless been close to that in 1917, the loss of pups due to the trampling of the bulls can not be expected to go much, if any, over 3 per cent.

This loss is under the control of man. He can make it 3 per cent or 2 per cent as he chooses by the simple expedient of controlling the number of males; that is, by increasing the average harem. It can not be done in a year, nor as the herd exists at present, in several years. But after the surplus piled up during the six seasons of closely restricted killings shall have become eliminated and the current quotas of killables are utilized systematically, there seems to be no obstacle in the way of keeping the average harem the size most desirable.

NUMBER AND DISTRIBUTION OF DEAD PUPS IN 1917.

Rookery.	Total pups.	Dead pups.	Percentage of dead.	
			1917	1916
ST. PAUL ISLAND.				
Kitovi	[a]2,520	[a]38	[b]1.50	1.09
Lukanin	2,235	61	2.72	4.01
Gorbatch	[a]8,649	[a]303	[b]3.50	2.84
Ardiguen	[a]726	[a]13	[b]1.79	1.00
Reef	17,442	457	2.62	1.12
Sivutch	[a]5,060	[a]127	[b]2.50	1.37
Lagoon	466	5	1.07	.77
Tolstoi	[a]15,433	[a]348	[b]2.25	1.21
Zapadni	9,828	261	2.65	1.51
Little Zapadni	[a]6,863	[a]223	[b]3.24	2.38
Zapadni Reef	358	10	2.79	1.50
Polovina	4,918	165	3.35	2.38
Polovina Cliffs	1,761	54	3.06	1.18
Little Polovina	1,260	15	1.19	1.39
Morjovi	[a]2,921	97	[b]3.32	1.59
Vostochni	[a]28,249	1,260	4.46	3.70
Total	108,689	3,437	3.16	2.19
ST. GEORGE ISLAND.				
North	[a]6,783	[a]169	[b]2.49	1.98
Staraya Artil	[a]5,642	[a]112	[b]1.98	1.53
Zapadni	1,050	17	1.61	.82
South	24	....	....	....
East Reef	1,786	24	1.34	1.07
East Cliffs	[a]4,050	[a]91	[b]2.24	2.07
Total	19,335	413	2.13	1.72
Total, both islands	128,024	3,850	3.00	2.12

[a] Estimated. [b] Based on estimated number of pups.

THE BREEDING COWS.

LOSSES AT SEA.

The fate of the fur-seal herd is directly dependent upon the breeding females. To prove this statement it is only necessary to refer to the fact that only two males are required to 100 females for breeding purposes, and it should be the object of the Government to spare no efforts in the protection and conservation of the females.

The number of breeding females in any one year is known to be equal to the number of young because each cow gives birth annually to one pup. Therefore the cows have increased from 81,984 in 1912 to 128,024 in 1917. This is a gain of 46,040 or 56.16 per cent, an average increase for five years of 9.36 per cent. This annual percentage of increase of the class in which we have most concern appears and is low, but it should be constantly borne in mind that it can not be expected, naturally, to materially increase in the future. During these five years the cows have had almost absolute protection as far as molestation by man is concerned. The great loss occurs at sea from unknown causes. It is known that the whales of the genus *Orca* devour seals to a greater or less extent, and if this is not the chief enemy there must be another which lives at sea and is at present unknown. The losses at sea in the first three years of their lives have been found to approximate 50 per cent of the seals born.

AGES OF COWS.

It is a well-established fact that the female seal begins her breeding career when 2 years old and brings forth her first pup when 3 years old. The male, however, is unable to breed under normal conditions until he is 7 years old. The length of the breeding period of both these classes is a very important matter and unfortunately is not very well known. It can only be learned from branded animals, and the number which can be thus marked is manifestly an insignificant portion of the total. For several seasons, the average breeding period of the cow has been placed at 10 years.

In 1900, 1901, and 1902 a number of pups were branded with a bar across the middle of the back. Some of these have returned annually ever since, and a photograph of one was printed in the report of the fur-seal investigation in 1914.[a] Altogether five were seen in 1917. This is very significant because the time given to search for them was exceedingly limited. It demonstrates, however, beyond question that the female does live 15, 16, or 17 years; that is, she can have 12, 13, or 14 pups. From this it appears that the deduction of 10 per cent from the breeding-cow class each year for old-age mortality is entirely sufficient.

THE 3-YEAR OLD COWS.

It is well to again test the natural mortality of the seals by applying the knowledge we have of the breeding cows, the same as has been done for two years past. The total number of breeding cows in 1916 was 116,977. By deducting the 10 per cent loss from old-age mortality, as explained above, of these in 1917 there should remain 105,280. To this number there was an increment of 22,744 composed, of 3-year-old females born in 1914, which brings the total up to 128,024. It is easy to ascertain the loss of female pups born in 1914 which would leave these 22,744. The total number of pups born that year was 93,350, half of which, or 46,625, should have been females. If the losses for the first three years had been exactly 50 per cent there would have been an increment of 23,312 in place of the 22,744, which has been computed. This is as close as a calculation of this character could be expected to come. It is entirely possible in one case that the births of males exceeded the females in 1914 by 568, which would make up the difference. And again it is possible that the loss varies to a certain extent each year and may sometimes run a little under or over this 50 per cent. At any rate this seems a very safe basis to work from and has been used in all deductions from all classes for natural mortality during the first three years of the seals' lives.

THE 5-YEAR-OLD BRANDED COWS.

Little can be said about the cows which were branded as pups in 1912 and were 5 years old in 1917. They were seen on practically every rookery and throughout the breeding season. The animals appeared normal in every respect and the brands seen were very distinct. Compared with unbranded cows on the rookeries they appeared very young. While they had not in most cases acquired the complete mask of white whiskers, they were much more

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[a] Bureau Fisheries Document No. 820, Pl. XII.

white than they had been the previous year. It is now believed that the whiskers of both sexes turn white at about the same age. Thus in most animals they begin to turn in the fourth year and are entirely white by the sixth. In size the 5-year-olds appeared fully adult.

HAREM AND IDLE BULLS.

Many of the data contained in this and in all preceding reports on the fur-seal herd have been derived from those classes of adult animals known as harem and idle bulls. These comprise both the males which are participating in the procreation of the species at the time of the height of the breeding season, known as harem bulls or harem masters, and that surplus skirting the margins of the rookeries which is unable to get cows, known as idle bulls.

Many facts go to make the adult male the subject of most trustworthy evidence respecting the seal herd. In the first place, he is four or five times as large as the female and therefore easily seen at a distance. Under average conditions of the sealing industry practically all of the bulls haul out of the water on the breeding areas in June and locate themselves 15 to 20 feet apart, where they stay until about the first of August. Thus the entire number can be counted.

In 1917 the average number of square feet of space occupied by each bull and his harem was determined, and since 1912 the average number of cows each one has been able to get has been obtained. Figuring from these bases it is now possible to make a fairly accurate census of the seal herd from a count of bulls alone at the height of the breeding season.

The count of bulls is known officially as the height-of-season harem count or just harem count. A full realization of its importance is had by all persons having knowledge of the fur-seal herd. It is very important that it be made as nearly as possible on the same dates year after year, and just as accurately as possible. It takes about a week to make the count.

Some rookeries are best counted from a boat, and others from a long ladder held upright at various places. Those which give most trouble are Zapadni and Reef on St. Paul, because the seals occupy a sloping beach which can not be seen from behind and a table-land which can not be seen from a boat. The crest between these areas should be marked in some way to assist in this work.

Preliminary counts are always made to acquire familiarity with the general distribution of the masses and the approximate numbers to be expected when the height of the season arrives. The dates chosen as representing the height of the season have been well established and mark the period when the largest number of bulls and cows are present on the rookeries.

Most of the harem bulls arrive and get into their positions on the rookeries before any appreciable numbers of cows arrive at the islands. The distance they were apart varied within the maximum and minimum of 24 and 12 feet in 1917, and the average was 18 feet. Each one knows the boundaries of his area, and any intrusion thereon promptly starts a battle. The bulls were about four jumps apart. Naturally when they are fewer they are farther apart and each one has more cows.

Those males actually having cows at the height of the season are recorded as harem bulls whether they have one cow or a hundred. Naturally with an abundance of bulls, as in 1917, there would be a

greater percentage of one-cow harems and the average would be correspondingly reduced. But there is a minimum beyond which the average can not go, because one cow per bull is impossible.

Those males which are in position about the margins of the breeding areas to receive cows but are without them are called idle bulls. In past years when bulls were scarce many young bulls 4, 5, and 6 years old came about the areas and necessitated the enumeration of a separate class, namely, the young bulls. But with the number of adult males existing in 1917 the younger animals have no chance to hold a position within reach of the cow masses, so that this class has been done away with as an integral part of the height-of-the-season harem count. All bulls about the breeding grounds in position to receive cows are either harem or idle bulls.

It was very evident in 1917 that even the adult males give up hope of securing cows if they can not get within a certain distance of them at the height of the breeding season. This distance seemed to be about equal to three layers of idle bulls on most rookeries. Thus if a bull comes to a rookery late and can not get within this distance he skirts the rear a time or two and then hauls away. The large number of idle bulls naturally provokes a great deal of fighting among them at the rear of the rookeries. This abandonment of the rookery areas was well illustrated in 1917 by the numbers of adult bulls hauled among the bachelors at the height of the breeding season. And this condition necessitated the computation of an additional class in 1917, known as surplus bulls. Their number must be estimated, not a very satisfactory procedure, but no counts worthy of notice are possible for a basis. As these animals haul with the bachelors they are taken up with that class.

The total number of harem bulls found in 1917 was 4,850, and idle bulls 2,706, a total of 7,556, as shown in the following table:

HAREM AND IDLE BULLS IN 1917.

Rookery.	Date.	Harem bulls.	Idle bulls.	Total.
ST. PAUL ISLAND.				
Kitovi	July 16	126	56	182
Lukanin	...do	100	54	154
Gorbatch	...do	279	130	409
Ardiguen	...do	33	28	61
Reef	July 17	613	237	850
Sivutch	...do	184	72	256
Otter Island	July 31		1	1
Lagoon	July 18	24	15	39
Tolstoi	...do	671	180	851
Suthetunga	...do	2	64	66
Zapadni	...do	420	342	762
Little Zapadni	...do	259	70	329
Zapadni Reef	...do	22	13	35
Polovina	July 19	166	130	296
Polovina Cliffs	...do	87	31	118
Little Polovina	...do	35	51	86
Morjovi	...do	127	83	210
Vostochni	...do	1,018	784	1,802
Total		4,166	2,341	6,507
ST. GEORGE ISLAND.				
North	July 25	266	114	380
Staraya Artil	...do	163	113	276
Zapadni	July 26	33	17	50
South	...do	6	6	12
East Reef	July 24	81	54	135
East Cliffs	...do	135	61	196
Total		684	365	1,049
Total, both islands		4,850	2,706	7,556

The next table, which shows percentages of gains of these classes, is very instructive. Thus harem bulls increased 38.57 per cent from 1916, while the idle bulls only increased 2.81 per cent. This in the presence of an enormous number of adult males out on the hauling grounds seems to be conclusive proof that when a bull can not get within about three places of a mass of cows he gives up and quits trying. If this proves true in succeeding years it means that the percentage of idle bulls to harem bulls will not normally be far from 50 when these classes exist in sufficient abundance to maintain the minimum average harem. The fact that this percentage went to 75 in 1916 and that the average harem was 33 (not the minimum as then suspected) means nothing more than that the idle bulls as a class were young and not able to secure cows from the stronger harem masters. If the average harem in 1916 had been at a minimum and the percentage of idle bulls 75, while in 1917 the harem had remained minimum, but idle bulls dropped to 55.7 per cent, it would be very suggestive that there were fewer bulls in the latter year. But since this is known absolutely not to have been the case, the explanation on the basis that the idle bull ceases to be one if he can not get within a certain distance of the cows seems justifiable.

In the light of this recently acquired knowledge, it would seem to have been permissible to have classed a portion of this 75 per cent of idle bulls in 1916 as young bulls. But since this is an indefinite division at best, it is believed it might have proved misleading.

COMPARISON OF HAREM AND IDLE BULLS IN 1917 WITH 1916.

Rookery.	Harem bulls.			Idle bulls.			Total.		
	1916	1917	Gain.	1916	1917	Gain.	1916	1917	Gain.
ST. PAUL ISLAND.			Per ct.			Per ct.			Per ct.
Kitovi	95	126	32.63	44	56	27.27	139	182	30.93
Lukanin	64	100	56.25	45	54	20.00	109	154	41.28
Gorbatch	234	279	19.23	110	130	18.18	344	409	18.89
Ardiguen	33	33	....	9	28	211.11	42	61	45.23
Reef	490	613	25.10	269	237	[a]11.88	759	850	11.98
Sivutch	162	184	13.58	111	72	[a]35.13	273	256	[a]6.22
Otter Island	....	....	....	....	1	....	....	1	....
Lagoon	13	24	84.61	8	15	87.50	21	39	85.71
Tolstoi	361	671	85.87	335	180	[a]46.26	696	851	22.27
Suthetunga	....	2	....	....	64	....	....	66	....
Zapadni	309	420	35.92	332	342	3.01	641	762	18.87
Little Zapadni	178	259	45.50	157	70	[a]55.41	335	329	[a]1.79
Zapadni Reef	8	22	175.00	1	13	1,200.00	9	35	288.88
Polovina	162	166	2.47	90	130	44.44	252	296	17.46
Polovina Cliffs	59	87	47.45	47	31	[a]34.04	106	118	11.32
Little Polovina	31	35	12.90	21	51	142.85	52	86	65.38
Morjovi	95	127	33.68	88	83	[a]5.68	183	210	14.75
Vostochni	654	1,018	55.65	611	784	28.31	1,265	1,802	42.45
Total	2,948	4,166	41.31	2,278	2,341	2.76	5,226	6,507	24.51
ST. GEORGE ISLAND.									
North	200	266	33.00	103	114	10.67	303	380	25.41
Staraya Artil	142	163	14.78	109	113	3.66	251	276	9.96
Zapadni	31	33	6.45	47	17	[a]63.82	78	50	[a]35.89
South	3	6	100.00	....	6	....	3	12	300.00
East Reef	73	81	10.95	44	54	22.72	117	135	15.38
East Cliffs	103	135	31.06	51	61	19.60	154	196	27.27
Total	552	684	23.91	354	365	3.10	906	1,049	15.78
Total both islands	3,500	4,850	38.57	2,632	2,706	2.81	6,132	7,556	23.22

[a] Loss.

THE AVERAGE HAREM.

Too much stress can not be placed upon the value of ascertaining the average number of cows per bull on the several rookeries and for the herd as a whole. This has long been recognized as one of the best methods of census calculation. The first pup counts ever made were on small rookeries to determine the average harem there, and this factor was applied to the total number of bulls. Thus the total number of cows was obtained and from it the other classes could be deduced. Naturally the value of the process depended upon the applicability to the herd as a whole of the conditions on the one or two rookeries on which pups were counted. It has been found through five years of complete pup counts that a few rookeries consistently have average harems approaching that of the whole. These rookeries should, of course, be taken as a type when only partial counts can be made.

This was done in 1917. Those rookeries were taken for counting which seemed from observations on the ground and from former conditions to have approximately the averages of the herd. The full details of the reasoning followed in then arriving at the average harems on those rookeries which were not counted are shown elsewhere.

It is practically certain that the average number of cows to each bull in 1917 was a minimum of 26.39. And it is just as true now as ever that the number of idle bulls makes this large or small. When the idle bulls are few the average harem is large; when they are many it is small.

In 1917 the percentage of idle bulls to harem bulls was 55 and the average harem 26.39. It is a safe inference, therefore, that whenever the percentage of idle bulls equals or exceeds this figure the average harem will not be far from the minimum. The importance of this fact will be appreciated in future census work when the herd has developed beyond the possibilities of pup counting. The following table of average harems for six years is very instructive. While the curves of each rookery have a general similarity to that of the total, very few are exact enough to furnish an indication of what the average harem will be in future years.

THE AVERAGE HAREM IN THE YEARS 1912–1917, INCLUSIVE.

Rookery.	1917	1916	1915	1914	1913	1912
ST. PAUL ISLAND.						
Kitovi	[a] 20.00	26.0	39.9	36.5	42.2	37.3
Lukanin	22.35	33.4	42.5	47.0	50.3	47.0
Gorbatch	[a] 31.00	37.9	45.9	54.9	60.1	59.0
Ardiguen	[a] 22.00	21.2	25.3	43.7	43.2	37.9
Reef	28.45	33.3	50.2	70.3	81.8	72.7
Sivutch	[a] 27.50	31.0	47.3	44.5	52.2	48.9
Lagoon	19.41	29.8	26.3	46.9	87.8	65.1
Tolstoi	[a] 23.00	33.4	49.0	61.7	80.4	88.1
Zapadni	23.40	33.3	50.5	66.9	75.0	70.1
Little Zapadni	[a] 26.49	35.3	53.6	54.7	79.2	72.7
Zapadni Reef	16.27	33.2	31.3	68.7	65.7	62.0
Polovina	29.62	29.3	59.4	61.3	83.6	62.2
Polovina Cliffs	20.24	28.5	47.1	65.9	69.4	51.6
Little Polovina	36.00	34.6	50.7	51.5	50.0	76.5
Morjovi	[a] 23.00	29.1	46.9	53.8	70.3	64.9
Vostochni	[a] 27.74	37.3	53.0	67.7	66.4	63.2
Total	26.08	33.53	49.27	60.3	69.6	65.0

[a] Derived from estimates.

THE AVERAGE HAREM IN THE YEARS 1912-1917, INCLUSIVE—Continued.

Rookery.	1917	1916	1915	1914	1913	1912
ST. GEORGE ISLAND.						
North	[a] 25.50	31.2	40.6	56.4	41.5	36.1
Staraya Artil	[a] 34.61	39.0	50.0	67.9	64.0	69.4
Zapadni	31.81	31.1	43.0	73.1	67.0	38.9
South	4.00	6.3	8.7	....	....	....
Little East	....	....	....	26.0	12.5	26.0
East Reef	22.04	21.7	34.9	41.5	26.1	23.3
East Cliffs	[a] 30.00	36.5	41.4	46.6	48.9	41.2
Total	28.26	32.82	42.51	57.1	49.1	42.5
Total, both islands	26.39	33.42	48.13	59.8	65.8	60.4

[a] Derived from estimates.

Some rookeries, which in the earlier years had averages which approximated the whole, later made considerable deviations therefrom. And the converse is true. No area can be said to constantly contain the average development of the herd in a single phase. But no other method is known whereby as accurate an estimate can be obtained as by the average harem method. Small rookeries, however, should not be considered in any deductions of this sort because they are erratic in development and growth and are subject to much greater variations than the larger ones.

AVERAGE HAREM AND PERCENTAGE OF IDLE BULLS TO HAREM BULLS, 1916 AND 1917.

Rookery.	1916				1917			
	Breeding cows.	Harem bulls.	Average harem.	Percentage idle bulls to harem bulls.	Breeding cows.	Harem bulls.	Average harem.	Percentage idle bulls to harem bulls.
ST. PAUL ISLAND.								
Kitovi	2,472	95	26.0 [a]	46.3	[a] 2,520	126	20.0	44.4
Lukanin	2,141	64	33.4	70.3	2,235	100	22.3	54.0
Gorbatch	8,864	234	37.9	47.0	[a] 8,649	279	31.0	46.5
Ardiguen	700	33	21.2	27.3	[a] 726	33	22.0	84.8
Reef	16,331	490	33.3	54.9	17,442	613	28.4	38.6
Sivutch	5,020	162	31.0	68.5	[a] 5,060	184	27.5	39.1
Lagoon	388	13	29.8	61.5	466	24	19.4	62.5
Tolstoi	12,065	361	33.4	92.8	[a] 15,433	671	23.0	26.8
Suthetunga	....	....	....	....	....	2	....	3,200.0
Zapadni	9,682	309	31.3	107.4	9,828	420	23.4	81.4
Little Zapadni	6,277	178	35.3	88.2	[a] 6,863	259	26.4	27.0
Zapadni Reef	266	8	33.2	12.5	358	22	16.2	59.0
Polovina	4,744	162	29.3	55.5	4,918	166	29.6	78.3
Polovina Cliffs	1,683	59	28.5	79.7	1,761	87	20.2	35.6
Little Polovina	1,074	31	34.6	67.7	1,260	35	36.0	145.7
Morjovi	2,761	95	29.1	92.6	[a] 2,921	127	23.0	65.3
Vostochni	24,387	654	37.3	93.4	[a] 28,249	1,018	27.7	77.0
Total	98,855	2,948	33.53	77.27	108,689	4,166	26.08	56.19
ST. GEORGE ISLAND.								
North	6,246	200	31.2	51.5	[a] 6,783	266	25.5	42.8
Staraya Artil	5,545	142	39.0	76.8	[a] 5,642	163	34.6	69.3
Zapadni	965	31	31.1	151.6	1,050	33	31.8	51.5
South	19	3	6.3	....	24	6	4.0	100.0
East Reef	1,585	73	21.7	60.3	1,786	81	22.0	66.6
East Cliffs	3,762	103	36.5	49.5	[a] 4,050	135	30.0	45.1
Total	18,122	552	32.82	64.13	19,335	684	28.26	53.36
Total, both islands	116,977	3,500	33.42	75.20	128,024	4,850	26.39	55.79

[a] Based on estimated number of pups.

The relation which the percentage of idle bulls to harem bulls bears to the average harem is shown in the table above. On following this line of data back there is seen to be a general relation on the rookeries where many idle bulls gather year after year. But as the idle-bull class as a whole moves and shifts about some, little can be gathered therefrom which can be made use of in the estimates for future years. The most important fact there shown is that a large percentage of idle bulls causes a small average harem.

HAULING-GROUND SEALS.

In 1914 it was attempted to make a simultaneous count of all seals on all hauling grounds in order that a positive statement could be made of the exact number present on a particular date. No greater value was placed upon the operation. All agree that it might differ on two consecutive days by several thousand because the bachelors are a moving, shifting lot, never stationary for any length of time, and governed to a certain extent in their movements by the weather. It takes a large force to make this count simultaneously on every rookery, much larger, in fact, than has been available since 1914.

At the time of the height-of-the-season harem count it is not difficult to stir up the sleeping bachelors and estimate their numbers. Any attempt to separate the young bulls from the bachelors for separate count would be folly. The two classes intergrade. A reasonable approximation to the numbers of each may be had by determining the proportion of each on one or two hauling grounds and applying this to the whole. This is as close as the value of the count warrants. In fact, it can not be seen how the results to be gained from this phase of the work justify the expenditure of any appreciable amount of time. Acting upon these premises, the following results were obtained in 1917. Dates are the same as in the height-of-season harem count table.

HAULING-GROUND SEALS ASHORE IN 1917 AT THE HEIGHT OF THE BREEDING SEASON, JULY 16–26.

Rookery.	Total.	Rookery.	Total.
ST. PAUL ISLAND.		ST. GEORGE ISLAND.	
Kitovi	38	North	1,025
Lukanin	340	Staraya Artil	750
Gorbatch	940	Zapadni	120
Reef	4,384	East Reef	647
Sivutch	300	East Cliffs	684
Tolstoi	1,210		
Zapadni	3,160	Total	3,226
Little Zapadni	700		
Zapadni Reef	45	Grand total	22,323
Polovina	3,000		
Little Polovina	250		
Morjovi	1,500		
Vostochni	3,200		
Total	19,097		

Thus there were somewhat over 20,000 seals on the hauling grounds at the height of the season. It has long been believed that the number on land at one time is about one-fifth of the total. This

would indicate over 100,000 in existence, a figure differing not greatly from the one derived later in this report from the birth rates. (See census summary, p. 123.)

This table contains actual counts in some cases. Here it was found there were 25 per cent as many bulls, old and young, as bachelors. This would make 5,580 of the former and 16,743 of the latter. It was manifestly impossible to determine the proportion of old and young bulls with any degree of accuracy worthy of notice.

THE DATA ON ROOKERIES WHERE COUNTING OF PUPS WAS NOT DONE.

It is admitted by all that an actual count of all living and dead pups is the best known means of arriving at a close estimation of all classes of seals in the herd. But when the number has increased to such an extent that complete pup counts become impracticable other means must be devised. Several methods may be considered.

1. AREA COMPUTATION.

In the early days of sealing, when the herd was very large as compared with its present size, this was the only method considered in arriving at a census. Thus Charles Bryant, the first agent of the Treasury Department on the Pribilofs, used it, and so far as known originated it. He was followed by H. W. Elliott in 1872–74 and again in 1890. His work was exhaustive, but the results were such that they received severe criticism. So bitter was the fight waged that the actual good in the area method of computation was lost sight of and was scarcely again considered until 1917.

The basis of any computation by this method must of necessity be a unit of area for each seal. A close approximation of the total breeding areas of any and all rookeries can be obtained by plotting them on charts. Then the division of the area by the unit gives the total number of cows, bulls, and pups in the space. The accuracy of the method depends upon (*a*) the skill of the observer in sketch-map work and (*b*) the correctness of the seal unit. Regarding the first, little can be said. The writer would consider Elliott's areas as given in his several reports very accurate indeed. His skill in delineation is well recognized. In 1915 and 1916 the writer plotted the breeding areas on the large scale Coast and Geodetic Survey charts of the rookeries at the height of the breeding season. Little time, however, could be given to this phase of the work, and it was attempted solely to give a general idea of the location of the breeding masses. Greater accuracy was not desired.

In 1917 A. C. Reynolds was detailed to assist in the seal-census work, and his training as a civil engineer especially fitted him for this phase of the work. His results are entirely satisfactory, and, coupled with other information related to census work, these give, in the writer's opinion, the most comprehensive view of area calculations which has so far been possible.

The unit of area assumed by Elliott to be occupied by each seal was 2 square feet. He made allowances for the difference in size of the bulls, cows, and pups, and the fact that only about one-half the cows are present at any one time on the rookeries. But he did not

have the means of getting this unit from actual counts on known areas. He appears to have been unduly influenced by large level massed areas and did not allow for much more enormous spaces, fully occupied, but less dense, owing to topographical features. At any rate, his results differed widely from conditions as they exist to-day.

In 1917 careful counts were made of harems on all rookeries and entire pup counts on 11 rookeries. Then the areas of all breeding grounds were ascertained. Thus there was secured the unit, as well as it was possible to get it, on 11 rookeries. These take in all types of topography found here. Some were small rookeries, but on the major ones the unit runs from 7 to 9 square feet per breeding seal. The following table gives this information concretely:

AREAS OF PRIBILOF ISLANDS ROOKERIES IN 1917 AND SEAL UNITS.

Rookery.[a]	Rookery space.	Seals.	Area to each seal.	Area to each harem.	Average distance apart of bulls.
ST. PAUL ISLAND.	*Square feet.*		*Square feet.*	*Square feet.*	*Feet.*
Kitovi*	50,715	5,166	9.81	402.5	20.0
Lukanin	37,170	4,570	8.13	371.7	19.3
Gorbatch*	103,950	17,577	5.91	372.5	19.3
Ardiguen*	18,855	1,485	12.69	571.3	23.9
Reef	236,250	35,497	6.65	385.4	19.6
Sivutch*	41,850	10,304	4.06	227.4	15.1
Lagoon	6,930	956	7.24	288.7	17.0
Tolstoi*	166,320	31,537	5.27	247.8	15.7
Zapadni	149,850	20,076	7.46	356.7	18.8
Little Zapadni*	66,420	13,985	4.74	256.4	16.0
Zapadni Reef	3,330	738	4.51	151.4	12.3
Polovina	69,300	10,002	6.93	417.4	20.4
Polovina Cliffs	36,090	3,609	10.00	414.8	20.4
Little Polovina	11,386	2,555	4.45	325.3	18.0
Morjovi*	41,130	5,969	6.89	323.8	18.0
Vostochni*	315,000	57,516	5.47	309.4	17.6
Total	1,354,546	221,542	6.11	325.1	18.0
ST. GEORGE ISLAND.					
North*	49,680	13,832	3.59	186.7	13.6
Staraya Artil*	51,300	11,447	4.48	314.7	17.7
Zapadni	19,710	2,133	9.24	597.3	24.4
East Reef	18,135	3,653	4.96	223.8	15.0
East Cliffs*	33,480	8,235	4.06	248.0	15.7
Total	172,305	39,300	4.38	251.9	15.9
Grand total	1,526,851	260,842	5.85	314.8	17.7

[a] Rookeries marked with an asterisk are those upon which complete counts of pups were not made and these were estimated by the average harem method as explained on page 108. South rookery, St. George Island, on which all pups were counted, is omitted from this tabulation. It had but 24 pups in 1917.

The average area per seal is seen to be about 6 square feet. The area per bull was obtained by dividing the areas by the number of harems which were found; and the distance each bull was apart is the square root of the area each occupied.

Such data as these are very valuable for use in conjunction with partial counts for arriving at a complete census after the herd is too large for all pups to be counted. It is to be regretted they have not been obtained since 1912 along with the complete counts. We would now have had concrete knowledge of the seal unit of area such as is obtainable only when the herd is small.

The accuracy of computing complete censuses from areas is not as great as from actual pup counts, and in 1917 it was not believed to be as reliable for computing the numbers on the rookeries not counted as the average harem based on a partial pup count with the average harem on the same rookeries which were counted this year. We know better the number of animals on a rookery by comparison with it in former years than we would know by assuming that the unit is the same for it as for some other which was counted. It so happens, however, that the two methods come out with more exactness than was at first anticipated. Rookeries not counted but estimated upon the basis of the average harem show a seal unit in close approximation to that found on rookeries which were counted.

The area method and the seal unit should be of increasing value as the herd grows from year to year until finally it supersedes all other methods. But as long as possible every known method of census work should be run in conjunction with every other, because at best any seal census can not be more than a close approximation to the truth.

2. THE AVERAGE HAREM ON ROOKERIES WHERE PUPS WERE NOT COUNTED.

While it was suspected on the islands that the increase in cows was not up to normal even before any pups were counted, owing to lack of expansion of certain breeding areas, it was well known after the first few rookeries had been counted. The percentage of increase of the pups, the number of dead pups, the expansion of the breeding areas, and the average harem all pointed to the same general result and indicated early about what the total number of breeding cows would be. It so happened, however, that Lukanin and Zapadni, the first rookeries counted, ran low-average harems this year, while last year they were normal. Conclusions drawn from those alone would have been fallacious, as subsequent counting proved, but after it was known that the percentage of increase in pups was approximately 9, it was evident about what the total number of breeding cows would be. This left the necessity, however, of assuming an arbitrary figure for the average harem on those rookeries which could not be counted.

Realizing the importance of determining the average number of cows to each bull on these rookeries as closely as possible, every phase of the sealing industry since 1912 was carefully considered. Naturally, one of the most instructive helps in this was the table of average harems for those years, as shown. When the known figures were placed in the proper columns, figures for the unknown were immediately suggested; but this was not enough. The table which follows was computed. It was run back to 1915 only, because previous to that the scarcity of bulls made the average harem a conjectural and inconstant quantity.

AVERAGE HAREMS IN 1915, 1916, AND 1917 ON ROOKERIES ON WHICH THE PUPS WERE COUNTED IN 1917.

Rookery.	1917	1916	1915
ST. PAUL ISLAND.			
Lukanin	22.35	33.45	42.5
Reef	28.45	33.32	50.2
Lagoon	19.42	29.8	26.3
Zapadni	23.40	33.3	50.5
Zapadni Reef	16.27	33.2	31.3
Polovina	29.62	29.3	59.4
Polovina Cliffs	20.24	28.5	47.1
Little Polovina	36.00	34.6	50.7
Average	26.08	31.9	49.82
ST. GEORGE ISLAND.			
Zapadni	31.81	31.1	43.0
South	6.00	6.3	8.7
East Reef	22.04	21.7	34.9
Average	23.83	24.0	36.82
General average	25.92	31.25	48.80

The significant portions of these data are the totals as compared with the totals for the entire herds for each island shown as follows:

	St. Paul Island.		St. George Island.		Both islands.	
	1916	1915	1916	1915	1916	1915
Average harem for rookeries on which pups were counted in 1917	31.90	49.82	24.00	36.82	31.25	48.80
Average harem for herds	33.53	49.27	32.82	42.51	33.42	48.13

Thus it is seen that in 1915 the average harem for the rookeries counted in 1917, 48.80, almost exactly coincided with the average for the herd, 48.13. The difference was 0.67 over. In 1916 the difference was 2.17 in the other direction. It would seem this indicates with sufficient clearness that if the average harem for the herd in 1917 is placed at 25.92, which was found on 11 rookeries, it will be within 2 of being correct. As the total number of harems was 4,850 it makes the possible error in the total number of breeding cows 9,700. The maximum error coefficient in this enumeration therefore becomes 7.71 per cent. It is regretted that this is so high, but there are no known means whereby it can be reduced when a complete pup count is not practicable. Upon consideration of all other data this is not as discouraging as it might seem at first glance.

The further the subject progresses the greater appears the necessity of assuming that the average harem for the entire herd is near that of the rookeries upon which counts were made. It can not vary more than two from this. Upon the completion of all calculations and when all assumptions had been made for rookeries not counted, the average harem for the herd was raised from 25.92 to 26.39, as shown in table on page 109. The principal influence bringing about this change was the fact that the average for the herd in 1916 was 2.17 greater than the average on the same rookeries counted in

1917. Had the average for the herd been placed 2 greater than that found on the 11 rookeries counted, however, it would have placed the total number of cows at 135,000, an increase which observations do not indicate as having taken place.

In deciding upon the average harems for those rookeries not counted which, together with those counted, would make the grand average 26.39, due consideration was given to make that estimate in every case conservative.

If the maximum variation allowable, 2.17, had been split in two and the average for the herd been placed at 27.08, it would have indicated that more cows came back than we now figure; that is, the loss was not 50 per cent during the first three years of the seals' life or the loss due to old age was not 10 per cent of the breeding cow class. Either of these conditions may be true and either makes the count as recorded herein farther on the side of safety; that is, it is much more apt to be under the actual figures than over, and this is as it should be. No absolute law can be established for losses at sea, and the percentages are undoubtedly subject to more or less variation from year to year, due to causes of which we at present have no knowledge.

3. PERCENTAGES OF DEAD PUPS AND PERCENTAGES OF INCREASE.

Before saying definitely what the total number of pups on a rookery which is not counted shall be in a season when other rookeries are counted, consideration should be given to two other factors than the average harem and the areas. These are the percentages of dead pups and increases. Either of these might form the basis of a census, especially in a year when harem counts for some reason are not made.

To analyze the values of these we must inquire into the causes of the conditions which are found. As shown in a preceding paragraph, page 102, the percentage of dead pups found on the rookeries was a fairly constant factor during the time when there was a large average harem. But with the increase in the number of bulls there has likewise been an increase in the number of dead pups found at the same seasons of different years. It is perfectly natural to record these as cause and effect. It is not disputed that 90 per cent of all dead pups found nowadays have been killed by the bulls fighting and charging over the breeding areas in the early part of the season. At the time of the count, however, few are in a fit state of preservation for autopsy. It is definitely known that some bulls kill more cows and pups than others do, and no law governs the return of these bulls to any particular rookery. The topography on some areas makes the death rate there higher than on others.

Therefore, while there is certainly a relation existing between the percentage of the dead pups to the total number of pups and the increase of bulls, it hardly seems necessary to resort to this method for census estimation, except in emergency. When the minimum average harem exists there is no doubt the percentage of dead pups from trampling is practically constant and the total number of pups could be arrived at very closely by the simple expedient of counting those dead after the breeding season. In future years it will be well to

bear this in mind, so that it can be made such use of as conditions may warrant.

The number of dead pups on those rookeries where they were not counted was arrived at in the same manner as the average harem; that is, the percentage of dead on the areas counted was compared with that of the herd in years past and a percentage assumed in 1917, which was in accordance with these facts. While the result can not be said to be known to be absolutely correct, it must be admitted that it can not be far from the actual conditions which existed. In tabular form the figures show as follows:

PERCENTAGES OF DEAD PUPS IN 1914, 1915, 1916, AND 1917 ON ROOKERIES ON WHICH THE DEAD PUPS WERE COUNTED IN 1917.

Rookery.	1917	1916	1915	1914
ST. PAUL ISLAND.				
Lukanin	2.72	4.01	1.43	3.9
Reef	2.62	1.12	1.65	1.5
Lagoon	1.07	.77	1.78	.5
Zapadni	2.65	1.51	2.19	1.6
Zapadni Reef	2.79	1.50	1.37	1.4
Polovina	3.35	2.38	1.73	1.9
Polovina Cliffs	3.06	1.18	.58	1.2
Little Polovina	1.19	1.39	1.13	1.8
Morjovi	3.08	1.59	1.58	1.8
Vostochni	4.67	3.70	2.75	2.5
Total	3.43	2.39	2.13	2.05
ST. GEORGE ISLAND.				
Zapadni	1.61	.82	1.11	.7
East Reef	1.34	1.07	.28	.8
Total	1.43	.98	.68	.81
Total, both islands	3.34	2.33	2.07	2.01

For the purposes in hand, the significant portions of this table are the totals, which, properly arranged, appear as follows:

	St. Paul Island.				St. George Island.				Both islands.			
	1917	1916	1915	1914	1917	1916	1915	1914	1917	1916	1915	1914
Percentage of dead pups on rookeries on which dead pups were counted in 1917	3.43	2.39	2.13	2.05	1.43	0.98	0.68	0.81	3.34	2.33	2.07	2.01
Total percentage of dead pups in herds	[a]3.16	2.19	1.82	1.9	[a]2.13	1.72	1.32	1.5	[a]3.01	2.12	1.74	1.8

[a] From estimates.

It is thus seen that the percentage of all dead pups in 1917 ust be less than 3.43 on St. Paul Island, more than 1.43 on St. George Island, and less than 3.34 for the entire herd. To produce this result, the figures given in the main table, page 103, have been used and seem very satisfactory for all requirements.

It might be believed by one little familiar with seal life that when a complete pup count is impracticable a few rookeries could be counted to get the annual increase, and by simply applying this factor to the entire herd a census would be arrived at. This, however, might give very misleading results with the rookeries as they

exist to-day. The increase on any particular rookery is solely dependent upon the number of cows coming there, and it is well recognized that no law governs their hauling out. Thus, the percentage of increase of pups (or cows) on almost all rookeries has been an exceedingly erratic figure during the past six years. For the present, therefore, this factor may be dismissed from census calculations as having little value. In the preceding tables wherever the numb r of pups (r cows comes in it should be remembered that this figure was computed from the average harem and these other methods of computation were used only as a check.

METHOD OF ESTIMATING BACHELORS.

The bachelor seals 1 to 6 years old must be estimated, no count worthy of serious consideration being possible. The most practicable method of arriving at their numbers has been found to consist in starting with the number of births of any one year and deducting therefrom each year certain losses.

The known losses are those killed on land in the regular proceeding of the sealing industry. Thus, since the last census, August 10, 1916, there have been killed on both islands 7,291 males over 1 year of age. These 7,291 animals must be divided into their respective ages, because killing is not and can not be confined to a single age, and it would not be desirable if it could, because the trade calls for more than one size and grade of skin. As a basis of the division into the several ages there have been available some data on seals which were branded when pups in 1912 through the initiative of George A. Clark, of Stanford University. Some of these seals have been killed each year and carefully measured in body lengths. A critical study of these lengths discloses the fact that there is considerable overlapping of every age in this character, so that a representative mean of the typical seal of each age must be assumed. This has been done wit ı great care.

The results show that a seal makes its year's growth almost entirely during the three months, August, September, and October; that is, a 3-year-old in the fall of the year has a skin about as large as a 4-year-old in the regular killing season. This fact should be borne in mind if in the future killings are limited to any particular ages. Any limit of age which may be specified is given in order to produce skins of a prescribed size, and these will not be produced if the same age limits obtain in the fall as in the spring. For instance, it has been customary during Government operation to order the killings confined to 3-year-olds. This meant that no skins smaller than those furnished by the mean summer 3-year-old were desired. Interpreted literally, then, all 2-year-olds in the fall were exempt even though they had the proper size skins. The scheme was, of course, faulty in this respect, that it prevented the killing of a size of animal until it should have run the chances of surviving a winter when death rates are very high. Of course the rational way to establish a quota is to specify the lengths of animals to be taken and pay no attention to age. Animals of known ages intergrade in every character known except osteological, so that ordinarily the age of a seal can not be determined until after it has been killed. The same objection applied to the limiting of killing to animals having skins of a specified weight. The weight of the skin of any live seal can be no

more accurately guessed than an unknown weight locked up inside of a container. But the length of the live animal can be estimated under any circumstances within 2 or 3 inches. This was demonstrated to the 1914 investigation committee by the writer, and a method of measuring was worked out which has steadily grown in popularity. The superiority of the method as a means of determining the size of skins being obtained over a guess at the age or the weight of the skins has been conclusively proved in three years' experience. By correlating the lengths with the ages of known branded animals an age relation to length has been established, and when the length of an animal is known it is also known whether it falls within the limits of length of the average seal of one age or the other.

A comprehensive study of the growth of fur seals is in preparation, but must necessarily proceed for several more years before being finished. The following standards, however, have been adopted from the studies already made as representing the lengths of average animals of each age thus far studied. It should be added that the limits are subject to change, as more data on growth of the animals are accumulated.

STANDARDS OF BODY LENGTH OF TYPICAL MALE SEALS.

Age.	Lengths of typical summer seals.	Lengths of typical fall seals.
	Inches.	*Inches.*
Yearlings	Up to 37	Up to 37.
2-year-olds	37 to 40	37 to 42.
3-year-olds	41 to 45	43 to 48.
4-year-olds	46 to 51	49 to 57.
5-year-olds	52 to 59	58 to ..
6-year-olds	60 and over	

T. ese standards have been used in segregating the classes of the several ages of seals killed during the year ended August 10, 1917. The yearlings are somewhat indefinite because only three unquestionable animals of this age have ever been studied; and these were in the fall. They do not reach the islands in the summer in sufficient numbers to become well known. T e limits beyond the summer 5-year-olds remain to be determined when the branded animals shall have grown older.

Arranged according to the above standards, the animals killed on both islands fall as follows, and the numbers have been deducted from the numbers of bachelors in each class in the estimates.

AGES OF SEALS KILLED ON THE PRIBILOF ISLANDS DURING THE YEAR ENDED AUG. 10, 1917.

Age.	Fall, 1916.			Summer, 1917.			Grand total.
	St. Paul.	St. George.	Total.	St. Paul.	St. George.	Total.	
Yearlings		1	1	5		5	6
2-year-olds	23	113	136	65	35	100	236
3-year-olds	447	339	786	1,708	1,857	3,565	4,351
4-year-olds	103	48	151	1,509	476	1,985	2,136
5-year-olds	2	1	3	445	18	463	466
6-year-olds and over				88	6	94	94
Total	575	502	1,077	3,820	2,392	6,212	7,289

In addition to the known loss which the herd of bachelors suffers at the hands of man there is in constant operation the great factor of natural mortality while the animals are away from the islands on their migrations. With cows this loss has been found to amount approximately to 50 per cent of all females during the first three years of their existence. No more reliable data are available to apply to the males, hence this deduction has been made. It is divided arbitrarily into 35 per cent the first year, 20 per cent the second, and 4 per cent the third. In this it is assumed both sexes are born in equal numbers.

There is natural mortality after the third year, but there are no means of knowing exactly or even with any approximation what it is but it must be a small percentage. It is believed allowances otherwise made are ample to more than offset it, hence no deductions have been made after the third year until the seals mature.

YEARLINGS.

The number of yearlings in the herd at the present time is ascertained from the number of pups born in 1916. This was 116,977. When the arbitrary number 40,941 based upon the assumption that the loss the first year is 35 per cent, is deducted there are left 76,036 to represent the males and females of this age in 1917. Half of these, or 38,018, should be of each sex, and this number is the best available for the females in 1917. Five males were killed as shown in the table on page 118, thus leaving 38,013. It seems an insignificant matter to deal with such small numbers when such large assumptions are involved, but it is believed that the more known factors which can be brought to bear in a problem dealing with unknown quantities the better the result will be. (It should be remembered by any person studying census computations that whereas exact figures are given whenever the calculations involved lead to them it is in reality intended that only the round numbers shall apply. The best which can be made is a careful estimate.)

There is little which can be added to the small amount of information already available about this group of seals. A male, however, was accidentally killed on St. Paul Island, August 10, 1917. Realizing the paucity of knowledge of the class, it was carefully measured and weighed and the skeleton was entirely preserved. Its importance seems to warrant a special study which has not been completed. It can be stated, however, that the animal was very fat, weighed 38 pounds and was 36 inches long. Its skin, removed in the usual commercial manner, weighed 7 pounds.

No difficulty need be experienced by anyone in recognizing the yearlings on the killing field or on the rookeries when it is remembered that the animals are no larger, and in most cases smaller, than the pups. But unlike the pups they have light gray throats and the older animals' coloration otherwise in most cases. Their heads have a puppish aspect, and like many animals the flippers (feet) grow large before the rest of the body. The lower canines are but little over half as large as those of the 2-year-olds.

2-YEAR-OLDS, MALE AND FEMALE.

The number of pups born in 1915 furnishes the basis for determining the number of this class at the present time; this was 103,527. The computations leading up to 1916 for this and subsequent classes have been published in previous reports of the Bureau of Fisheries and need not be repeated here. Thus there were computed 33,646 female yearlings in 1916, 20 per cent are supposed to have died the second winter, leaving 26,917 virgin cows in 1917.

There were estimated 33,645 yearlings males for 1916. One was killed in the fall which left 33,644. Deduct the 20 per cent for natural mortality and there remain 26,915 at the beginning at 1917. An even hundred were killed as 2-year-olds, which leaves 26,815 for the class on August 10, 1917.

3-YEAR-OLD MALES.

The number of 3-year-old males is derived from the births of 1914, or in other words, from the 2-year-olds in 1916. The latter figure was 24,169. Of these 136 were killed in the fall of 1916, leaving 24,033. Deduct 4 per cent for natural mortality and there remain 23,072 for the beginning of 1917. During the past summer (1917) 3,565 were killed, so that there should remain on August 10, 19,507.

The 3-year-old females bore pups for the first time in 1917 and are therefore included in the breeding-cow class.

4-YEAR-OLD MALES.

The number of 4-year-old males is derived from the number of births of 1913 or the 3-year-olds in 1916. The 3-year-olds in 1916 numbered 19,402. As explained heretofore no deductions need be made for natural mortality of bachelors after the third year. Therefore, we need only deduct the number of animals killed on land in the regular course of events. In the fall of 1916 and the summer of 1917 there were taken of the 3-year-olds and 4-year-olds, respectively, 786 and 1,985. Deduct these numbers and there remain 16,631.

5-YEAR-OLD MALES.

This category is derived from the pups born in 1912 or the 4-year-olds of 1916. The latter figure was 15,427. Deduct 151 4-year-olds killed in the fall of 1916, and 463 5-year-olds killed in the summer of 1917, and there remain 14,813.

6-YEAR-OLD MALES.

The number of 5-year-olds computed for 1916 was 15,494. Three were killed that fall leaving 15,491, and 94 6-year-olds, or over, were taken in the summer of 1917. Some of these were known to have been over 6 years old, but as the limits of this age are not yet defined and the number concerned is insignificant it may be deducted from the class. This leaves 15,397 to enter the surplus and idle-bull classes in 1918. After the age of 6 years is reached it is very probable that the

body lengths will express little if any age relations because of the variation in the sizes of bulls which are fully adult. That is, the curve is then becoming a straight line which continues through the rest of the seals' lives.

SURPLUS BULLS.

There were counted at the height of the breeding season 7,556 idle bulls and harem bulls. Now, the hauling grounds and rookery margins were filled with other bulls over 6 years of age, but which could not get close enough to the masses of cows to desire to hold positions. Some had been whipped and injured on the rookeries and had resorted to the hauling grounds to recuperate. They were all left uncounted. To complete the census, it becomes necessary to prepare an estimate of this class, because they are included in no other. Heretofore it has not been necessary to include such a category, because bulls were not then superabundant. They were nearly all about the rookeries, and the number left uncounted as idle bulls and harem bulls was insignificant. But this was not the case in 1917. They got in the drives to such an extent that they interfered considerably with sealing work. These surplus bulls were largely 7 and 8 year old animals, and may be best estimated by starting with the 6-year-old males of 1916.

The number of 6-year-old males in 1916 was 11,167. None was killed in the fall of 1916. In 1916 there was a total of 6,132 breeding males. When there is an abundance of bulls, and consequently much fighting, their breeding age is probably not over 8 years. It is not believed to be as long as the females, because the branded males of 1901, 1902, and 1903 have not been as much in evidence as the females. It may be even less than 8 years; no satisfactory means of determining this question is known. By assuming that it is 8 years makes it necessary to deduct 12½ per cent (766) from the 6,132 bulls of 1916 for loss due to old age. This leaves 5,366 of the 1916 bulls for 1917. This deducted from the total bulls of 1917 (7,556) makes an increment of 2,190 necessary on the rookeries, and they were derived in sufficient entirety from the 6-year-old class of 1916 to be taken from them. This leaves 8,977 of the 6-year-old animals of that year unable to get on the rookeries, and they are called surplus bulls. While it is known that not all of these were 7-year-olds which were hauled away from the rookeries, it is believed that there were enough of this class which did not get cows or became idle to offset the number of older bulls on the hauling grounds. And while this computation may appear somewhat indefinite, no better method has occurred by means of which the number may be arrived at more satisfactorily. Most certainly these bulls on the hauling ground can not be ignored and left unmentioned because they are difficult to estimate. It is believed that the figure given is conservative and under rather than over the actual number. This class will not continue longer than it takes to reduce the surplus of bulls now obtaining by commercial sealing.

COMPLETE CENSUS OF FUR-SEAL HERD, 1917.

Pups, as per counts and estimate		128,024
Breeding cows, 3 years old and over		128,024
Harem bulls, as per counts		4,850
Idle bulls, as per counts		2,706
Yearlings, male and female:		
Pups born in 1916	116,977	
Deduct 35 per cent for natural mortality	40,941	
Yearlings beginning of 1917	76,036	
Females, 50 per cent	38,018	
		38,018
Males beginning of 1917	38,018	
Males killed in 1917	5	
Males Aug. 10, 1917		38,013
2-year-old male and female:		
Yearling females Aug. 10, 1916	33,646	
Deduct 20 per cent for natural mortality	6,729	
2-year-old females in 1917		26,917
Yearling males Aug. 10, 1916	33,645	
Males killed fall of 1916	1	
Males end of 1916	33,644	
Deduct 20 per cent for natural mortality	6,729	
2-year-old males beginning of 1917	26,915	
2-year-old males killed 1917	100	
2-year-old males Aug. 10, 1917		26,815
3-year-old males:		
2-year-old males Aug. 10, 1916	24,169	
2-year-old males killed fall of 1916	136	
2-year-old males end of 1916	24,033	
Deduct 4 per cent for natural mortality	961	
3-year-old males beginning of 1917	23,072	
3-year-old males killed in 1917	3,565	
3-year-old males Aug. 10, 1917		19,507
4-year-old males:		
3-year-old males Aug. 10, 1916	19,402	
3-year-old males killed fall of 1916	786	
3-year-old males end of 1916	18,616	
4-year-old males killed in 1917	1,985	
4-year-old males Aug. 10, 1917		16,631
5-year-old males:		
4-year-old males Aug. 10, 1916	15,427	
4-year-old males killed fall of 1916	151	
4-year-old males end of 1916	15,276	
5-year-old males killed in 1917	463	
5-year-old males Aug. 10, 1917		14,813
6-year-old males:		
5-year-old males Aug. 10, 1916	15,494	
5-year-old males killed fall of 1916	3	
5-year-old males end of 1916	15,491	
6-year-old males killed in 1917	94	
6-year-old males Aug. 10, 1917		15,397

Surplus bulls:

Breeding bulls in 1916	6,132	
Deduct 12½ per cent for old age loss	766	
1916 bulls in 1917	5,366	
Total bulls in 1917	7,556	
Deduct 1916 bulls in lot	5,366	
Increment of young bulls in 1917	2,190	
6-year-old males in 1916	11,167	
Deduct increment going into breeding bulls class, 1917	2,190	
Surplus bulls Aug. 10, 1917		8,977

RECAPITULATION.

Pups	128,024
Breeding cows	128,024
Harem bulls	4,850
Idle bulls	2,706
Yearling females	38,018
Yearling males	38,013
2-year-old females	26,917
2-year-old males	26,815
3-year-old males	19,507
4-year-old males	16,631
5-year-old males	14,813
6-year-old males	15,397
Surplus bulls	8,977
Total, all seals	468,692

MORTALITY OF FISHES ON THE WEST COAST OF FLORIDA

By Harden F. Taylor
Scientific Assistant, Bureau of Fisheries

Appendix III to the Report of the U. S. Commissioner of Fisheries for 1917

CONTENTS.

MORTALITY OF FISHES ON THE WEST COAST OF FLORIDA.

By Harden F. Taylor, *Scientific Assistant, Bureau of Fisheries.*

OCCASION FOR THE INVESTIGATION.

Repeatedly in the past 75 years reports have come from the west coast of Florida of "poison water," which killed fishes in large numbers, and also, according to some reports, other animals, notably sponges. The reports and references are too fragmentary to give an accurate record of the distribution of the mortality, but collectively they clearly indicate that all the keys from Key West nearly as far north as Cedar Keys have been visited by this plague, and that it occurred in the years 1844, 1854, 1878, 1880, 1882, 1883, 1908, and finally in 1916.

REPORTS OF THE DISASTER IN 1916.

In October and November, 1916, the mortality recurred in severe form, the first visitation since 1908. Numerous descriptive reports were received, from which the following significant points were summarized:

Fishes of a great number of species were noted dead and dying; the air was charged with a suffocating gas, which not only occasioned severe discomfort to man and other air-breathing animals, but irritated the air passages, producing the symptoms of colds. This gas, while exceedingly irritating, had no odor. The fishing smacks which are equipped with "wells" or openings through to the water in which live fish are kept report that the whole catch died while the smacks were en route to port; the normal color of the water had given way to water of different color, variously described as "black streaky," "amber," "olive," and "red"; the white paint of certain houses near the water was temporarily blackened, apparently by gases from the enormous number of dying fish. Some local observers found fish dying in the sounds; others noted them in the passes and in the Gulf to a distance of 45 miles out, but the abundance of fish in any locality varied from day to day. The reports of the order

in which the species appeared are not consistent, so it is assumed that there was no particular succession of species. The abnormal conditions seemed to be moving southward, occurring at Boca Grande on October 3 and 18, at Captiva Pass about the middle of October, at Blind Pass about October 20, at San Carlos Pass about November 1, and dead fish were first seen at Big Marco Pass on November 5. Captiva Pass is 7.5 statute miles south of Boca Grande Pass; the others are, respectively, 16.5, 27.75, and 67.75 miles to the south of Boca Grande Pass. The captain of the steamer *Roamer*, of the Florida Shellfish Commission, reports that dead fish were seen as far south as Cape Romano, about 128 miles south of Boca Grande. The death of two persons in Fort Myers, Fla., in November, was attributed to the eating of some of these dead fish.

The following letters from George H. Skermer, deputy collector of customs at Boca Grande, describing the phenomenon, merit reproduction here. Letter dated October 22, 1916, reads:

I wish to call your attention to an unusual phenomenon which has occurred on the Gulf coast during the past month, and which, so far as I am able to ascertain, has extended on the north to Sarasota and south to Naples, westward, from 15 to 20 miles.

About October 3, large quantities of what are locally known as "red-mouth grunts" began to come ashore. These fish were normal in appearance, with the exception that many showed a tendency to have the eyes almost forced out of their sockets. The early morning of the third the Gulf was covered with these fish as far as the eye could see. Later in the day many other varieties began to drift in, and by night what might be styled windrows of them were lying along the beach. Among them were many fish altogether strange to us; among the known varieties were mackerel, jacks, small shark, porkfish, sheepshead, toadfish (several varieties), mangrove snappers, grouper, sardines, seahorse, cowfish, remora, moray, eels, mullet, pinfish, gurnards, ladyfish, grunts, and many other varieties, not all of which showed the tendency to "popeye."

Soon after this drift commenced I went to the beach accompanied by a small dog; while on the beach I felt a slight tendency to sneeze and cough; shortly afterwards my attention was called to the action of the dog which was sneezing violently and seemed to be in acute distress, choking and showing every symptom of asphyxiation. I carried him off the beach and in a short time he seemed to recover, so I carried him back, and the same thing happened again. I then noticed that my lungs were feeling sore and that my breathing was labored, in much the same manner as when I board ships after fumigation, except that I could notice no odor. Other people were affected the same way.

Later in the day the captain of the Cuban fishing smack *Rafaela Pedre*, which had run into the harbor for water after a 45-day trip, come to the office and told me that his entire catch of grouper and snapper had died almost immediately after the tide started in. I questioned him carefully and found that they had noticed the peculiar sensation I have above described. The next day another smack came in with her fish dead and reported that dead fish covered the Gulf for miles out. The captain of the Dutch steamship *Zeta*, which arrived on the 8th, reported that he had passed through miles of dead fish.

In a few days the plague abated, very few more coming in.

However, on the 18th another violent outbreak occurred, this being much more serious than the first, inasmuch as it had killed many large fish which did not seem to be the case during the first attack. For the past few days the beach has been lined with tarpon, jewfish, grouper, and many varieties of top fish which seemed to escape the first attack. In addition to this, many of the bay fish are succumbing. The gas was very violent this time and many people telephoned for medical assistance for "cold in the head," "sore throats," "cold in the chest," etc., besides coming to see the local physician, who is also the United States quarantine surgeon here. I, myself, have suffered quite acutely for the past five days, but the worst of the gas seems to be going now.

I tried the dog again, and again had to take him off. I do not think he would have been able to live over two hours on the beach. The fish died in a very short time. I observed a mullet dying yesterday; as the tide came into the bayou the gas met him, he began to act strangely, coming to the top, whirling around and around, and then sank to the bottom, lying stomach up for a little while, when he turned on his side dead. Spadefish acted the same way. It is now reported that the fish are dying freely in the remote bays and bayous, every local variety seeming to give up its share. I have been told that many of the barnacles have also died, but I can not confirm this. I have noticed that the conchs and crabs are not dying, at least to any extent. * * *

If you desire any other information as to this matter, I shall be glad to furnish it if it lies in my power. I meant to state that I noticed the pungent feeling of the gas particularly when a wave "broke" and believe that this will explain why the top fish escaped with less visible destruction than the bottom, the breaking of the wave aerating the water more or less. * * *

The gas has none of the characteristics of H_2S; it acts with the same peculiarity of chlorine, but is odorless, perhaps is CO_2; addition of lead acetate to sea water gives a dense white precipitate, but am not sure but that it might do that normally, precipitating lead chloride.

The "odorless but exceedingly irritating gas," as described, was not noted by the observer, but had, perhaps, already subsided. The protrusion of the eyeballs was due to the accumulation of gases from decay behind the orbits, as only those fishes which had been dead for some time were thus affected.

A letter from Mr. Skermer, dated November 11, 1916, reads:

I am in receipt of your letter of the 8th instant relative to the supposed presence in the Gulf waters of *Peridinii* in abnormal numbers. I wish to state that I have not been able to learn of such conditions obtaining nor have I noticed any marine growth of abnormal appearance at any time during the mortality periods. However, I have inquired carefully at every opportunity since the fish began to die from any person who I had reason to suppose had come in contact with the dying fish as to whether he had noticed any peculiarity in the water. I learned from two persons that the fish seemed to die in "streaks" and sometimes in dark-colored water; others noticed nothing abnormal in the appearance of the water but did speak of the odorless but exceedingly irritating gas which seemed to be liberated at intervals. * * *

This morning I inquired of a Spanish fisherman, who lives about 7 miles south of Boca Grande, as to conditions near him. He informed me that fish were still dying along the Captiva Pass and inside waters of Pine Island Sound. He further stated that the fish died when coming in contact with it. The dark-colored water he said was in the bays and did not enter the Gulf at all except at low water. From this I am inclined to believe that it is

simply an overflow of swamp water, and do not believe that it is the cause of the mortality.

The fish were killed many miles out in the Gulf. The captain of the Dutch steamer *Themisto*, which arrived here October 27, told me that he passed through immense numbers of dead fish 45 miles out. I asked him if he noticed anything abnormal in the appearance of the water, and he said "No." A fishing smack which entered here lost all its fish after entering the bay, and another reported that upon attempting to enter the bay saw its fish beginning to die, and that upon turning about and going into the Gulf they recovered. I can only reconcile the two circumstances in this way: For several days after the fish ceased dying in the Gulf they died in the bay, and it is probable that the last-mentioned smack met the returning current from the bay to the Gulf, while the first-mentioned got it in full strength from the Gulf in the beginning of the attack, as he was anchored in the tidal channel. * * *

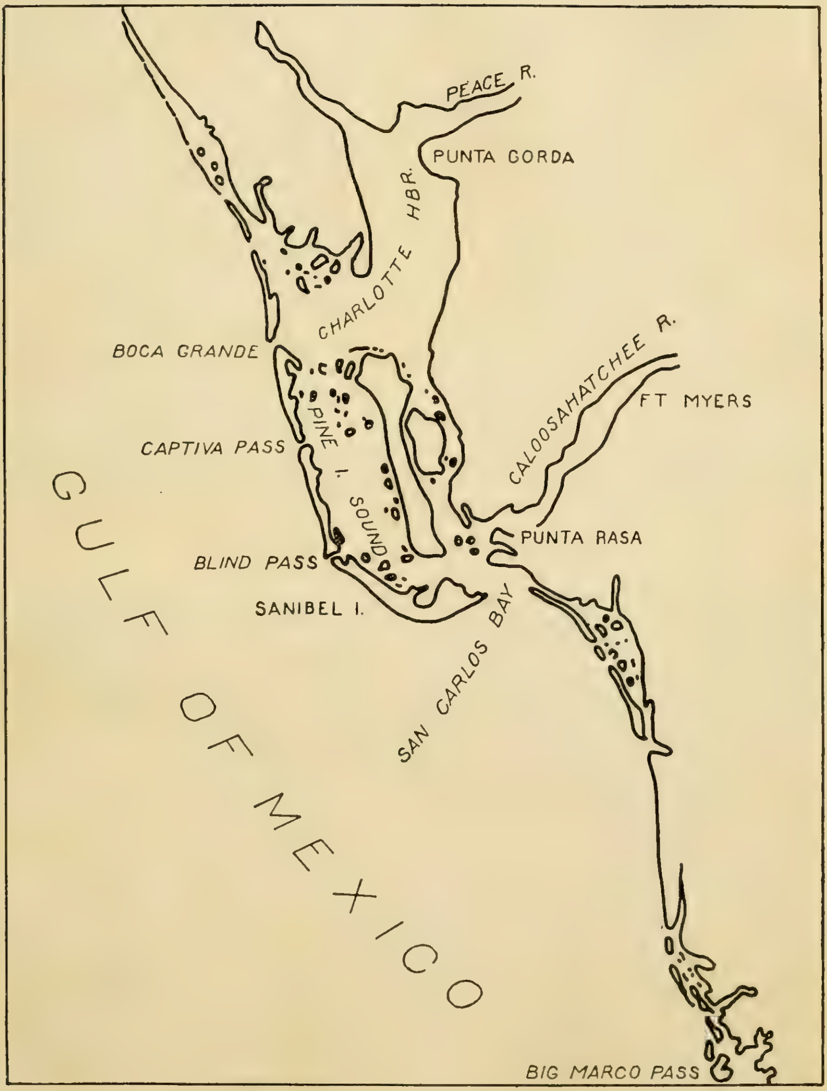
INVESTIGATION IN THE FIELD.

Conditions made it impossible to undertake a field investigation during the early stages of the mortality when it was at its worst, but the writer arrived at Fort Myers, Fla., on the Caloosahatchee River, November 12, and remained in the region for a period of 10 days.

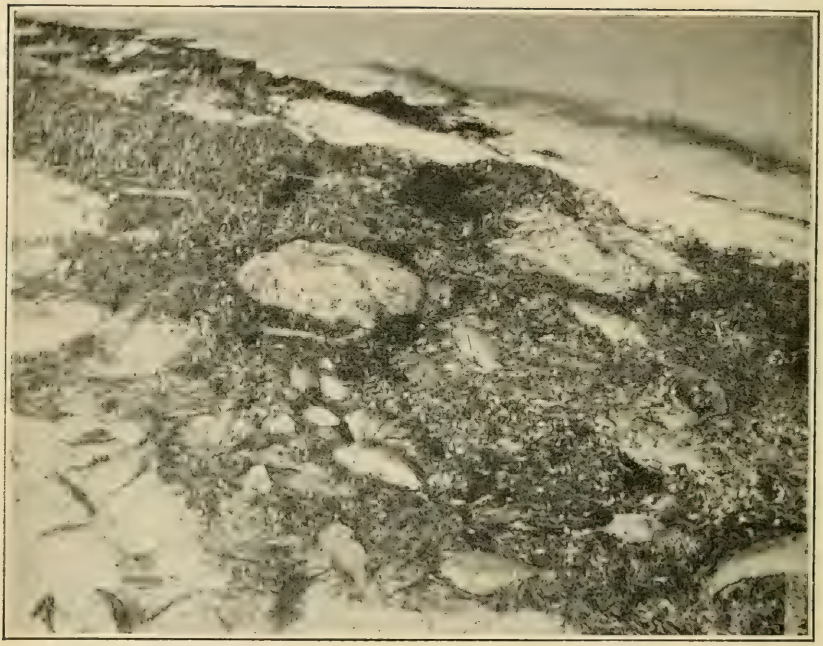
Since the mortality of the fishes had been ascribed to foul water from the Everglades, the condition of this river was first noted. No abnormal conditions were observed in the river; small fish were abundant; birds were feeding upon them. Schools of mullet and red drum ("redfish"), vast numbers of ducks, and many pelicans were seen on the river below Fort Myers. In no case was a dead water animal found on the river. The water was of a brownish color, due, presumably, to tannin or other pigments from the mangroves and palmettoes, but it is understood that such a condition is not unfavorable to fish.

On the next day a reconnoissance trip was made on a river steamer from Fort Myers down the Caloosahatchee to Punta Rasa, thence across San Carlos Bay to Sanibel, across the bay again to St. James City, on Pine Island, thence across Pine Island Sound to Wulfert (inside mouth of Blind Pass), then through a narrow channel to Captiva, returning the same day via Sanibel and Punta Rasa. Between Fort Myers and Punta Rasa (18 miles) the river appeared to be normal in every respect. In San Carlos Bay dead fishes were noted, blanched and soft, apparently having been dead for some time. On the inside beaches of Sanibel, Pine, and Captiva Islands dead fishes in great numbers and of a multitude of species were noted, all in a state of decay.

On the return trip, near Sanibel Wharf, a specimen of squeteague (*Cynoscion nebulosus*) was taken in a state of rigor mortis, but without apparent abnormality.



MAP SHOWING REGION WHERE MORTALITY OCCURRED.



SAN CARLOS BEACH, SANIBEL ISLAND, NOVEMBER 19, 1916.

GULF BEACH, SANIBEL ISLAND, NOVEMBER 19, 1916.

Beginning the next day, November 13, the writer spent three days in the vicinity of San Carlos Bay, with headquarters at Sanibel. In this interval water samples were collected at various places in San Carlos Bay and Pass, Pine Island Sound, Tarpon Bay, and Blind Pass. Efforts made to collect bottom samples were successful only in obtaining pieces of shell and fragments of a thin layer of lime deposit which seems to cover the bottom in San Carlos Bay and Pine Island Sound. Such qualitative tests as were made indicated a rather strong alkalinity. On November 13 and 14 dead fishes were in greater abundance, coming in, apparently, on the tide. On the 13th a census of dead fishes was taken covering 20 steps of the San Carlos Beach, Sanibel Island. This census revealed 163 specimens of fishes, of 26 species, and included neither the windrow cast up at high tide, nor those floating, but only those at or close to the water's edge. On the dark nights of that week the phosphorescence of the decaying fishes made the beach visible for a long distance, and the sand was so charged with phosphorescent bacteria that one's tracks persisted for some seconds. Familiar fishes were identified by their own light. The odor was almost intolerable; people dwelling on the islands hauled away wagonloads and buried them in their orchards for fertilizer.

SPECIES AFFECTED.

In all the region covered the following species were noted:[a]

Species.	Common name.	Family.
Manta birostris[b]	Devilfish	Mantidæ.
Ocyurus chrysurus[b]	Yellow-tail	Lutianidæ.
Neomænis griseus	Mangrove snapper	Do.
Epinephilus morio[b]	Red grouper	Serranidæ.
E. striatus	Nassau grouper	Do.
Garrupa nigrita	Jewfish	Do.
Centroprist■ striatus	Sea bass	Do.
Menticirrhus sp.[b]	Whiting	Sciænidæ.
Cynoscion nebulosus	Spotted squeteague ("trout")	Do.
C. sp	Squeteague ("trout")	Do.
Bairdiella sp	Sand perch	Do.
Pogonias cromis	Black drum ("drum")	Do.
Sciænops ocellatus	Red drum, channel bass ("redfish")	Do.
Tarpon atlanticus[b]	Tarpon	Elopidæ.
Caranx hippos	Crevallé	Carangidæ.
Caranx crysos	Crevallé ("skip jack")	Do.
Selene vomer	Moonfish	Do.
Trachinotus carolinus	Pompano	Do.
Oligoplites saurus	Leather jacket	Do.
Scorpæna sp	Scorpionfish	Scorpænidæ.
Mugil cephalus	Mullet	Mugilidæ.
Hæmulon plumieri	Grunt	Hæmulidæ.
H. sciurus	do	Do.
Bathystoma rimator	Red-mouth grunt	Do.
Anisotremus virginicus	Porkfish	Do.
Monacanthus sp	Filefish	Monacanthidæ.
Do	do	Do.
Scomberomorus regalis	Cero; kingfish	Scombridæ.
Rissola marginata	Cusk eel	Ophidiidæ.
Scarus vetula	Parrotfish	Scaridæ.

[a] The identifications here represented are, of course, open to question. Time did not admit of careful study. On the great majority of the fishes the colors had faded, of several species only badly decomposed specimens were seen, and some of the others were quite unfamiliar to the observer.
[b] Not seen by writer, but reported by fishermen and others.

Species.	Common name.	Family.
Chætodipterus faber	Spadefish	Ephippidæ.
Archosargus probatocephalus	Sheepshead	Sparidæ.
Otrynter caprinus	Long-spine porgy	Do.
Calamus sp	Porgy	Do.
Lycodontis (moringa?)	Black moray	Murænidæ.
L. (jordani?)	Spotted moray	Do.
Paralichthys sp	Flounder	Pleuronectidæ.
Echeneis remora	Remora, shark pilot	Echeneididæ.
Clupanodon pseudohispanicus	Sardine ("shiner")	Clupeidæ.
Brevoortia tyrannus	Menhaden	Do.
Chætodon ocellatus	Butterflyfish	Chætodontidæ.
Angelichthys ciliaris	Angelfish	Do.
Lactophrys tricornis	Trunkfish ("cowfish")	Ostraciidæ.
Lactophrys trigonus	Trunkfish	Do.
Prionotus sp	Sea robin	Triglidæ.
Opsanus sp	Toadfish	Batrachoididæ.
Spheroides sp	Puffer ("toadfish")	Tetraodontidæ.
Chilomycterus spinosus	Burr fish	Diodontidæ.
Dasyatis (say?)	Sting ray	Dasyatidæ.
Raja sp	Skate	Rajidæ.
Ætobatus narinari	Spotted sting ray	Myliobatidæ.
Rhinobatus lentiginosus	Guitar fish	Rhinobatidæ.
Felichthys felis	Gaff-topsail catfish	Siluridæ.
Galeichthys (milberti?)	Sea catfish	Do.
Hemirhamphus sp	Halfbeak; needlefish	Hemirhamphidæ.
Tylosurus sp	Marine gar; needlefish	Belonidæ.
....	Small eel; whip eel	Moringuidæ?
Leptocephalus conger	Conger eel	Leptocephalidæ.
Synodus fœtens	Lizard fish	Synodontidæ.
Sphyrna tiburo	Shovel-nose shark	Sphyrnidæ.
Carcharinus (obscurus?)	Shark	Galeidæ.
Albula vulpes	Ladyfish	Albulidæ.
Ogcocephalus vespertilio	Batfish	Ogcocephalidæ.

Of invertebrates, sea urchins (*Arbacia*), the king, or horseshoe crab (*Limulus*), and sponges were noted. It is a matter worth noting that very few animals other than fishes were killed. Barnacles, oysters, and mussels were examined, but they were in good condition. Live conchs and hermit crabs were repeatedly observed. Porpoises were plentiful during the period of observation. Pelicans and other water birds behaved normally. Buzzards were common in the locality, yet they neglected the dead fish entirely.

The dead fauna of the Gulf beach was not markedly different from that of the bays. Relatively more carangids, sharks, and rays were seen, but many of the dead forms were buried in the hard beach sand, hence the Gulf beach did not present such a striking picture as did the inside beaches. Taking the whole territory into consideration the relative abundance of the different species is estimated as follows in the order given, less abundant species being omitted:

Grunt (*Hæmulon plumieri*) (*H. sciurus*).
Mullet (*Mugil cephalus*).
Trunkfish (*Lactophrys trigonus*) (*L. tricornis*).
Puffer (*Spheroides* sp.).
Menhaden (*Brevoortia tyrannus*).
Sardine (*Clupanodon pseudohispanicus*).
Red-mouth grunt (*Bathystoma rimator*).
Spadefish (*Chætodipterus faber*).
Moray (*Lycodontis* sp.).
Filefish (*Monacanthus ?*).
Sheepshead (*Archosargus probatocephalus*).
Spotted squeteague (*Cynoscion nebulosus*).

It is assumed that the numbers are representative of the relative abundance of these forms in life. The sizes of specimens would also suggest that all true fishes were killed, regardless of size. They range from jewfish of approximately 200 pounds to forms less than 2 inches long.

METEOROLOGICAL CONDITIONS.

The temperature of the water was around 75° F. until November 15. On this date a violent "northwester" blew up, occasioning a series of extraordinarily high and low tides. After this the temperature was 65° F., and continued at about that figure through the remainder of the observation period. Contrary to what might be expected, the mortality of fishes did not cease after the storm. In this connection it may be added that the wind had been blowing constantly from the northeast for several weeks previously and, after the storm, shifted around to the northeast again.

The water was olivaceous in color—about such a color as would be expected from a mixture of sea water with the brownish water of the rivers. Those accustomed to seeing the water stated that during the period of mortality the water was of a more brownish color than usual. The wake of the boats had an oily appearance, or was apparently not so effervescent as that in normal sea water. It was further stated that at the height of the mortality, on the Gulf coast, the water was of an amber color (by transmitted light). This colored water was described as being not uniformly distributed, but occurring in streaks, and it was in these streaks that the fish are said to have perished. A resident of the island described the death of a mullet thus:

> The fisherman was following a large mullet in Tarpon Bay (partly inclosed in Sanibel Island), intending to capture it with a cast net. The fish, at a depth of possibly 2 feet, seemed suddenly to strike a streak of the bad water, came rapidly to the surface, flipped from the water, and, after a short struggle, expired.

The exact spot, about 6 feet from shore, was visited by the observer, but nothing unusual was noted. Several dead mullets were seen ashore; live porpoises and conchs were in the water.

EXAMINATION OF SPECIMENS.

On November 16 a mangrove snapper (*Neomœnis griseus*) was taken by a boatman in a moribund condition. The writer first saw this fish a few minutes after it had died, and he at once dissected it. The blood was not yet coagulated, and, indeed, seemed less inclined to coagulate than one might expect. The fish was not infested with parasites, no lesions were noted, the gills were pink (perhaps too red), the stomach contents were small fish, clean and constituting an

apparently wholesome food. The liver was slightly abnormal in appearance, being faintly mottled with a lighter shade of brown. The mucous covering of the body was transparent and colorless; none of the organs were distended by gas, nor were gas bubbles observed in the blood vessels. The eyes were clear, and no evidence of fungus was seen. The coloring of the fish was vigorous.

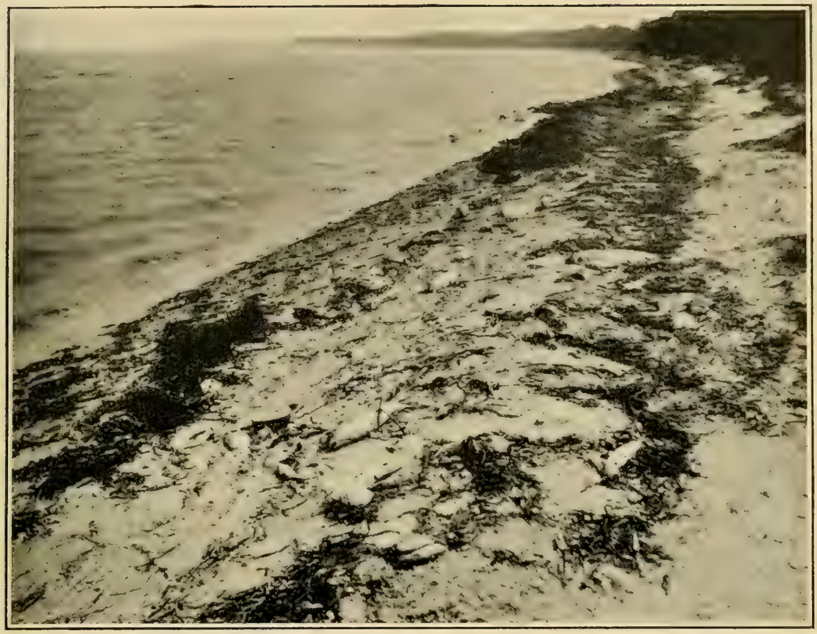
Fishes in a moribund condition were reported as having been observed in the passes, in the Gulf, and in Tarpon Bay, but since the carcasses drifted with wind and tide the mere presence of dead fish was not an indication of a mortality at any given place. The condition sought for must have been immediately at hand, however, when a moribund fish was observed on November 19.

It was a small filefish (*Monacanthus* sp.), and was first observed near the dock at Bailey's Wharf, Sanibel, in water not over 3 feet deep. The fish was brilliantly mottled with maroon on a slate-colored background. It was drifting upon its side, making but slight effort to balance. This fish was captured and placed in a bucket of the water from which the fish was taken. A moment later a small, active, pinfish was captured in the same place and likewise kept in another bucket with some of the same water. The color of the filefish faded, but repeatedly revived when the fish was disturbed; each response, however, was weaker than the preceding one until the fish died, and the color faded in about 2 hours. The pinfish, taken at the same time and place, lived till it was released at Fort Myers, about 6 hours later. Both species had repeatedly been noted dead upon the beach. Within 50 feet of the point where the filefish was dying numerous mangrove-snappers and sheepshead were seen, quite healthy in appearance. So we have the anomalous condition of dying fish and perfectly healthy fish within 50 feet of each other and in the same water, with certain knowledge that all the species concerned are subject to destruction by the abnormality responsible for the death of so many species.

Representations were made to the writer concerning the pollution of Peace River. This is a small sluggish stream, tributary to Charlotte Harbor, and drains a region now being worked for phosphate rock. It was said that the waste from the works destroyed the fish. However true this may be, a brief visit only was necessary to show that such a pollution could have no bearing on the mortality under consideration. Small fish as well as vegetation were in the stream; and, besides, the stream is of insignificant size.

DISCUSSION OF POSSIBLE CAUSES OF THIS AND SIMILAR DISASTERS IN OTHER PARTS OF THE WORLD.

It may said at the beginning of this discussion that while a definite conclusion has not been reached as to the cause or causes of this



VIEWS OF SAN CARLOS BEACH, SANIBEL ISLAND, NOVEMBER 19, 1916.

VIEWS OF SAN CARLOS BEACH, SANIBEL ISLAND, NOVEMBER 19, 1916.

mortality, yet certain possible causes are shown not to be operative. Furthermore, significant circumstances in the case of 1916 and of previous years, records of similar disasters in other parts of the world, and opinions of representatives of the numerous sciences concerned, are brought together here as the basis of discussion and also for further work, if there should be a recurrence of the phenomenon.

The mortality occurred in 1844, 1854 (Ingersoll, 1882), and a very severe attack was reported in January, 1878. In August, September, October, and November, 1880, it occurred again, but in relatively milder form. The last two instances are said to have been preceded by earthquakes. In July, 1882, the plague returned; in this case it may be connected with the tilefish disaster, which occurred at the edge of the continental shelf south of Nantucket along the 100-fathom line. In the summer of 1908 a similar mortality destroyed the sponge beds along the keys between Key West and the mainland. In 1916, as above stated, the mortality was exceedingly severe between Boca Grande Pass and Big Marco Pass. The older reports are meager and not based on direct observations; in some cases invertebrates—chiefly sponges and king crabs—were predominant, in others, sharks and porpoises. It may, then, be assumed that the reports furnish no reliable indication of exact conditions.

The causes suggested are (1) water from the Everglades charged with tannin and products of decomposition of palmettoes and mangroves; (2) extraordinary abundance of *Peridinium* known to have occasioned the death of fishes in different parts of the world; (3) a disease, fungoid, parasitic, or bacterial; (4) dilution of the water by unusually heavy rains; (5) an issue of gas, volcanic or natural; and (6) earthquakes or seaquakes.

FOUL WATER FROM THE EVERGLADES.

1. A hypothesis that has been advanced repeatedly is that water from the Everglades, charged with tannin and the products of decay in vegetation, is brought down by the rivers and kills fishes. It may be said with sufficient certainty that this is an impossible explanation. For there are no a priori grounds for assuming that the Everglade water is poisonous; nor is there any material evidence of such a condition. No fresh-water fishes were killed; life in the river was normal; and fishes are known to live in the Everglades. The sporadic appearance of the phenomenon casts doubt on the possibility of such an explanation. And, finally, it seems quite impossible to believe that the volumes of the rivers are sufficient to account for such a widespread distribution of the mortality. It may be, however, that the accumulation of the river load as a decaying organic sediment

furnishes the gases and other products of decomposition confined for a time, but sporadically released by what may be found to be the proximate cause—seismic disturbances. This possibility will be discussed later.

PERIDINIUM AND OTHER PROTISTS.

2. An extraordinary abundance of *Peridinium* has, at times, caused the death of a great number of fish and crustacea. Under certain circumstances, as yet unknown, these organisms multiply in vast numbers, giving the sea a reddish or chocolate color. Such colored areas are usually accompanied by an offensive smell, and are sharply marked off from the unaffected water. They have been encountered by mariners in many parts of the world, and numerous accounts appear in the literature. Darwin (1846) observed it "a degree south of Valparaiso," Nishikawa (1901) and Mitsukuri (1904) on the Japan coast, Carter (1858) around the island of Bombay, Mead (1898) in Narragansett Bay, Smith (1903) in Manila Bay. Both Darwin and Carter cite numerous other references.

Dr. R. E. Coker records (in unpublished notes) from the coast of Peru a phenomenon possibly due to the same cause and commonly known as the "painter." This phenomenon has been described by Hutchinson (1873) thus:

> * * * There is an interesting peculiarity here * * * called the "painter," the palpable evidences of which consist in a changed color of the sea water (most generally to a muddy white), an odor most fœtid, nauseous, and depressing, with the accompaniment of the white paint on ships and boats, inside as well as outside, becoming totally discolored and often partially black. * * * I am induced to attribute this emanation chiefly to submarine volcanic action, generating sulphuretted hydrogen gas. * * * Although met with at Callao, in its most aggravated form, the "painter" is likewise found along the coast as far as San Jose de Lambayeque, nearly 500 miles north. From the end of December until April is the time when the phenomenon mostly exists.
>
> I have before me an analysis of the sea water of Callao, bottled up during the existence of the "painter" and having some mud from the bottom of the bay contained therein. This was sent * * * to London, and was there analyzed by Mr. T. Keates. Mr. Keates reports that, after being allowed to rest, the water poured off proved to be sea water and that the black mud left, after the water had been decanted, was in a state of active decomposition, large quantities of sulphuretted hyrogen gas as well as sulphate [sic] of ammonia being given off. The black color of the mud was found to be owing to the presence of sulphate [sic] of iron which was formed as a result of the decomposition mentioned. Whilst this latter was due to the sulphur of the organic matter combining with the iron present in the mineral part of the mud, to produce the black sulphide [sic] * * *.
>
> 1 000 parts of the mud dried at 230° F. yields:

Water	769. 6
Dry mud	230. 4

100 parts of the mud dried yielding by analysis:

Organic matter	10.50
Chloride of sodium, alkaline sulphates, etc	6.43
Salts of lime	3.75
Alumina of [and?] oxide of iron [sic]	16.00
Siliceous matter	63.25
Loss	.07

* * * In the course of a few days I observed the water of the bay under four different aspects.

First. Ochre-brown, with somewhat of a reddish tinge, and opaque. This, when examined under the microscope, showed animalculæ of a spheroid or circular form and of like color to the water. In 12 hours after it was—

Second. Of a dark green, and still thick aspect, in which, by the microscope, was visible another class of animalculæ of an hourglass form, round and broad at each end, but contracted at the center. Although there was but one drop of the water under the glass, a large number of these jumped about.

Third. The next morning, or in 14 to 16 hours afterwards, the water was a muddyish white. This time the smell in the harbor was most pungently nauseating. It is considered the true "painter" when white paint becomes black, and headaches are general, with everybody under its influence. No animalculæ were visible through the microscope in this state of affairs from the second to the third condition. I may add that in the intervening period we had a shock of earthquake at about 5 o'clock in the morning, and during the occurrence of which it may be conjectured submarine volcanic action destroyed all animal life of these insects seen two days previously.

Fourth. This is the ordinary water of Callao Bay. * * *

From Hutchinson's description it would appear doubtful that this was *Peridinium*. Darwin's observations (1846) may help to clear this up:

On the coast of Chile, a few leagues north of Concepcion, the *Beagle* one day passed through great bands of muddy water exactly like that of a swollen river; and again, a degree south of Valparaiso, when 50 miles from land, the same appearance was still more extensive. Some of the water placed in a glass was of a pale reddish tint and, examined under a microscope, was seen to swarm with minute animalculæ darting about and often exploding. Their shape is oval and contracted in the middle by a ring of vibrating curved ciliæ. It was, however, very difficult to examine them with care, for almost the instant motion ceased, even while crossing the field of vision, their bodies burst. Sometimes both ends would burst at once, sometimes only one, and a quantity of coarse, brownish granular matter was ejected. The animal an instant before bursting expanded to half again its natural size, and the explosion took place about 15 seconds after the rapid progressive motion had ceased; in a few cases it was preceded for a short interval by a rotatory movement on the longer axis. About two minutes after any number were isolated in a drop of water they thus perished.

This may explain the ephemeral nature of the animalculæ, and also, since they die in such vast numbers, it is not difficult to conceive the consequences of the decay of so much organic matter.

Carter (1858) shows that the various hues of sea water, as described, are due, at least around the Island of Bombay, to one organism, *Peridinium sanguineum*. In the swimming stage the organism is green

and translucent; as the transition time approaches, the chlorophyll-like substance responsible for the green color disappears, a red substance takes its place and dissolves in oil globules that have been forming. At this stage it is red and visible to the naked eye. After only a few days the individuals assemble, lose their red color, become encapsulated (*Protococcus* form), and sink or float on the surface. This stage is followed by a subdivision into two or four new ones. This latter process may be repeated several times until eventually a ciliated form appears again, completing the life cycle. The latter form is covered by an excessively fragile shell which "is broken by the pressure of the thinnest piece of glass."

This description explains the varying color of the streaks, the periodicity, and it may explain the bursting observed by Darwin, if he used cover glasses in observing them.

Could this have been the cause of the trouble in Florida? No evidence of the presence, in extraordinary numbers, of these organisms was found. When the water was described as red, further questioning brought out the fact that it was by transmitted light on the beach, and not by reflected light. Fishes observed while dying were in clear water. Still, the condition as described may have existed before the writer arrived, and the dissolved decomposition gases might have persisted in the water to an extent fatal to fishes after the organisms responsible had perished. Or the organisms might have become lost from view either by disintegration or by passing into the protococcus form and sinking, as suggested by Carter (1858). But such red water, to explain the conditions found, would have to be distributed over an unprecedentedly large area to persist for two months and yet escape detection by the many passing ships, and it would be necessary to explain the widely fluctuating periodicity, in some cases one year, in two other cases 24 and 25 years, respectively.

Gilchrist (1914) definitely ascribes certain instances of mortality on the South African coast to *Noctiluca* and to diatoms. These forms, decaying in large numbers in the water, make the latter an unfit medium for fishes. Among the instances described by him as due to obscure causes, one is clearly due to *Peridinium*.

DISEASE AND PARASITES.

3. Evidence of disease or parasitism is likewise lacking, as is shown by the examination and dissection of specimens already described. On the other hand, it would be difficult to believe, without the most thoroughly convincing evidence, that so many species of animals could be affected by an epidemic of any single disease, or that such

a disease would confine itself to a limited locality for the larger part of a century or perhaps a much longer period of unrecorded observation.

DILUTION OF THE WATER.

4. Dilution of the water hardly deserves serious consideration, for the phenomenon is not correlated with the rainy season or unusual discharge of the rivers. As shown by the table, the salinity does not indicate serious dilution of the water. Of course a dilution adequate to explain the mortality of fishes would concern only an excess of run-off above the normal. The area of ocean concerned, in comparison with the small rivers, at once negatives this hypothesis; and if the water were sufficiently diluted, it may be assumed with good reason that unconfined fishes would seek their proper salinity by migration.

VOLCANIC AND NATURAL GASES.

5. It is now time to call particular attention to certain circumstances of prime importance that have served largely to destroy the foregoing suggested causes, and which can not be overlooked in arriving at a conclusion. They are (*a*) the irregular periodicity, both as to years and seasons; (*b*) the strictly marine aspect of the phenomenon; (*c*) the large area covered; (*d*) the definite limitation of this locality; (*e*) the limitation of the mortality to the animals, whose respiration is performed by an oxygen carrier, hæmoglobin, hæmocyanin, etc.; (*f*) the progressive southward appearance of the mortality.

The irregular periodicity, the marine aspect, the area covered, and particularly the limitation to the region concerned all suggest a geological explanation, whether the issue of a gas or the occurrence of an earthquake, fixed in one place, sporadic in outbreak, and independent of weather fluctuations. The species affected and the southward progress are not contradictory to such an explanation, as will be seen.

Dr. T. W. Vaughan, of the United States Geological Survey, stated verbally to the writer that he saw only the remotest possibility of a volcanic gas in this region. The region is inactive volcanically, and the discovery of a volcanic fumarole would occasion great surprize to geologists. Beyond that we have nothing for or against volcanoes. There is no question that volcanic gases would be deadly to fishes. For, while volcanoes emit different gases in different stages of their activity, the emissions always contain substances deadly to fishes, if nothing worse than carbon dioxide It is scarcely necessary to present data here as to the composition of such gases. Any chlo-

rine, as hydrochloric acid or as ammonium chloride, or in any soluble combination whatever, would certainly be detected by the chlorine determination (salinity); sulphur gases and carbon dioxide would alter the alkalinity of the water, though much would depend on the freshness of the water when the determinations were made. An unfortunate delay impaired the value of the samples collected; it was therefore impossible to determine whether or not these gases were present.

Similar remarks concerning natural gas issues may be made. Such gases consist, of course, largely of the light paraffins, usually small quantities of olefines and occasionally some carbon monoxide. Little is known of the effects of these gases on fish. The injury to man done by methane is done chiefly or entirely by the mere dilution of the air by this gas. Ethylene and ethane probably act in a similar manner. These gases are slightly soluble in water, ethylene to the extent of 4 per cent volume. In water these gases could not act as they do in air, for the solubility of a gas is quite independent of all other gases and as much oxygen would be present in a saturated solution of any of them as in their total absence.

Of carbon monoxide more can be said. This gas acts as a poison to animals, whose respiration is dependent on a blood pigment by combining firmly with the pigment to the exclusion of oxygen; while these animals situated in the presence of abundant oxygen and presenting a wide area of "semipermeable" skin, and whose respiration is performed by the agency of oxygen dissolved in the blood plasma, are immune, since carbon monoxide does not interfere with the passage of oxygen into the body (Leitch, 1916). Carbon monoxide is soluble to a sufficient extent thus to interfere with respiration. It is therefore suggestive to note that all the animals killed, except sponges, were dependent on a blood pigment (hæmoglobin, hæmocyanin, echinochrom, etc.). Sponges are the only animals observed on the beaches whose respiration is not dependent on one of these carriers or pigments, but sponges are often seen, even in normal times on the beaches.

In February and March, 1894, the *Albatross* investigated and reported on a case of widespread mortality of fishes off the coast of California between Santa Barbara and San Diego. Evidences there obtained indicated petroleum and hydrocarbon gases as the cause of the disaster. Many species were killed, but those dead were chiefly flatfish and barracuda. The odor of petroleum was evident from the dead fish. The body slime was colored yellow in patches, and the gall bladder was ruptured. The oil springs said to exist off the coast were held responsible for the oil and gas issues.

EARTHQUAKES.

6. Earthquakes kill fishes directly by concussion. Oldham (1899) cites the case of the destruction of fishes in the Sumesari River in India by the great earthquake of June 12, 1897, which killed "myriads as by the explosion of a dynamite cartridge." Numerous other instances are cited by various authors.

It is not evident in this case from the data at hand that earthquakes killed the fishes directly by concussion. The following extract from a letter from the United States Weather Bureau bears on this point:

> Our records show that during 1916 there were no seismic disturbances of any considerable severity in the Gulf region.
>
> We have no precise earthquake records of that region for the earlier dates, 1844 * * * 1908, but probably no severe ones occurred, as this is not an active seismic region.

Further than this, the long duration of the mortality, the southward progress, and particularly the death of fishes under observation in the partly inclosed shallow water, entirely dismisses the hypothesis of direct injury by shock.

It seems possible, however, that the incidental effects of earthquakes might explain the death of the fishes. For instance, gases are sometimes emitted along with the shock. The following quotation from Darwin pertains to this aspect of the subject:

> In Capt. Fitz Roy's excellent account of the earthquake (Chile, 1833, Jan. 20), it is said that two explosions, one like a column of smoke and another like the blowing of a great whale, were seen in the bay. The water also appeared everywhere to be boiling; and it became black and exhaled a most disagreeable sulphurous smell. These latter circumstances were observed in the Bay of Valparaiso during the earthquake of 1822; they may, I think, be accounted for by the disturbance of the mud at the bottom of the sea containing organic matter in decay. In the Bay of Callao during a calm day I noticed that as the ship dragged her cable over the bottom its course was marked by a line of bubbles.

Prof. J. B. Woodworth, of the Harvard seismographic station, sets forth, in a letter of some length, a possibility which has not been considered, and which seems worth investigating. The substance of his letter is as follows:

Previous to the cases of 1908 and 1916 there are no satisfactory records of seismic activity in the region concerned. It may be quite possible, however, that unobserved shocks of low intensity could explain the mortality; that occluded gases, resulting from the decay of sedimentary organic matter, are released by a disturbance of the sediment, under which circumstances the occluded gases would rise into the water, dissolve, and interfere with the life processes of fishes. Or, at the edge of the rather wide continental shelf in this region, a

seismic disturbance of low intensity might cause accumulated sediments to slide off into abyssal water, similarly releasing occluded gases and also mixing up the mud with the water. It is known that microseisms (as Prof. Woodworth terms them) are radiated from this locality, and it is believed by some that they are due to the West Indian cyclonic storms.

This seems to be the most promising hypothesis. It might be expected that the water flowing into this region carries a large amount of organic matter leached from the abundant Florida vegetation and held in colloidal solution; that this organic matter, on striking sea water heavily charged with lime is flocculated and falls to the bottom on the uncommonly wide expanse of continental shelf in this region; that as it accumulates on the bottom it decays anaerobically, yielding methane, hydrogen sulphide, possibly carbon monoxide, and other gases; that these gases, as generated, are confined by the pressure, increasing sediment, and, perhaps by the limestone crust which appears to cover the bottom; that an earthquake shock, even an unnoticeably mild one, would so disturb the sediment, or break the crust, as to release the occluded gases, and that these gases work, by various physiological and chemical means, the injury to fishes. These organic gases, being rare in sea water, would never be detected by the ordinary analyses.

The work of Prof. J. P. McClendon at Tortugas, in the summer of 1916, suggests that the marginal supply of oxygen in this region is not great. In a letter on the subject he says:

> I think probably lack of oxygen killed the fish. When the P_H of tropical sea water reaches about 7.5 there is no oxygen left in the water. At Tortugas the P_H was about 8.15 and there was about 4 cc. of oxygen per liter.

It would, of course, be necessary to explain any deficiency of oxygen.

ALKALINITY AND SALINITY OF THE WATER.

These two determinations were made as being most likely to reveal any unusual condition of the water. The alkalinity is somewhat higher than that of pure sea water. Dole found this to vary between 0.00237 N and 0.00257 N; McClendon found the alkalinity at Tortugas in 1916 to lie between 0.0023 N and 0.0025 N, while the samples taken in the region under discussion had an alkalinity varying from 0.00236 N to 0.00297 N. This may be explained by the large amount of fresh water flowing into the salt water in this region, which is generally rather strongly alkaline. The salinity is lower than that of pure sea water; this is likewise explained by the fresh water flowing in.

It is noteworthy that the water in which the filefish was seen to die was of the highest salinity and lowest alkalinity found. Otherwise, there seem to be no factors showing any striking correlation.

The following are the results of such determinations as were made:

ALKALINITY AND SALINITY.

Date.	Fraction of normal alkali.	Salinity.	Remarks.
1916.		‰	
Nov. 19	0.00297	29.94	In shallow water at Bailey's wharf, Sanibel, where filefish died.
Nov. 13	.00294	32.81	Sanibel post-office wharf; surface; day before storm; sealed in glass; 76.5° F.
Nov. 16	.00289	31.52	Sanibel post-office wharf; surface; day after storm; 65° F.; very low tide.
Nov. 19	.00288	30.61	Bailey's wharf, Sanibel; 2 fathoms (bottom); 50 feet from point where filefish died; live mangrove snappers.
Nov. 14	.00282	33.93	One-half mile from Point Ybel Light, San Carlos Pass; 75° F.
Do	.00277	34.20	One and one-half miles from Point Ybel Light, San Carlos Pass; sample from surface; water 2 fathoms; 72.4° F.
Nov. 15	.00277	32.96	Place where mullet died, shallow water of Tarpon Bay; described by fisherman; 1½ hours before storm; 75.3° F.; live conchs; porpoises in water.
Prior to Nov. 13.	.00272	33.10	Specimens submitted by West Coast Fish Co., Kitchins Island, Pine Island Sound.
Nov. 19	.00261	30.97	Bottom (2 fathoms) off Point Ybel Light wharf, Sanibel, 1½ miles from point where filefish died; 65.4° F.
Nov. 15	.00260	32.43	Near Gulf mouth, Blind Pass; rising tide; surface sample; 2½ fathoms water; 20 minutes before storm broke; 75.8° F.; probably pure Gulf water.
Nov. 19	.00236	31.98	Surf water on Gulf Beach.
Mean	.00276	31.56	

OTHER MORTALITIES DUE TO OBSCURE CAUSES.

Other mortalities have occurred in different parts of the world, due to obscure causes. Austin H. Clark (1903) observed a mortality of fishes on the coast of Venezuela, which seems similar to that off the Florida coast. Nordenskiöld (1882) noted dead *Gadus polaris* in the Siberian Polar Sea, which he supposes to have been killed by an insufficiency of oxygen, under the ice, where the fish were confined. Cold has unquestionably brought about the death of fishes in many parts of the world.[a]

Gilchrist (1914) cites numerous mortalities on the South African coast in addition to those already cited, ascribed to *Peridinium*, *Noctiluca*, and diatoms, but altogether without satisfactory explanation. One, however, deserves particular mention. In this case (which repeats itself annually at Knysna) there was a narrow streak of yellowish water extending along the coast for miles, of a temperature about 10° F. lower than the blue ocean water farther out, which was clearly marked off from the yellowish water. The author attempts to explain this by the meeting off this coast of the Mozambique (warm)

[a] On Feb. 2 and 3, 1917, a "freeze" occurred on both coasts of Florida, killing thousands of fishes. This cold wave is described by R. H. Fitch in a forthcoming paper of the Weather Bureau.

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and the Antarctic (cold) currents by which the cold water is forced upward along the coast and is limited offshore by the warm current. The periodic nature of the phenomenon is, however, not explained.

This mortality of fishes on the Florida coast may be of interest and importance in many respects. It would hardly be an exaggeration to assert that the number of fishes that perished would be sufficient to supply the State of Florida for a season Yet a few weeks after normal conditions were restored we were informed that fishing on the Florida coast was as good as ever.[a] These facts give rise to the suggestion that, enormous as are the numbers of fishes in our coastal waters, natural causes may be quite as destructive to them as are the activities of man.

The question has arisen repeatedly as to the means by which the strata, rich in fossils of fishes, were laid down. Instances like this and dozens of other in as many parts of the world readily answer the question. Large numbers of decaying animals may also have a bearing on the formation of other mineral beds—the phosphates, for example, that might be produced from the organic phosphorus.

It is also true that, if this misfortune should occur again, valuable information may be gained concerning the presence and number of the various species of fishes, their winter habitat, distribution of sizes, etc., from a study of the dead fishes themselves.

SUMMARY AND CONCLUSIONS.

A mortality of fishes occurred on the coast of Florida from October 3 to the last of November, 1916, appearing progressively southward from Boca Grande to Marco, and apparently killing representatives of all local species of fishes, but very few other aquatic animals, in the sounds inclosed by the keys and in the Gulf of Mexico for a distance of 45 miles or more, but not affecting fresh-water forms. Meteorological conditions were normal. Post-mortems revealed nothing pathological in the fishes. The salinity of the water was somewhat lower than that of normal sea water, and the alkalinity somewhat higher.

The cause of the mortality in this region, as has been stated, has not been determined. Foul water from the Everglades as a possible cause may be dismissed, as well as all meteorological conditions. Volcanic action is highly improbable, and attention need not be turned to such a possibility from the evidence now at hand. *Peridinii* appear to furnish an exceedingly unlikely explanation, but it is, perhaps, proper to reserve judgment, as the evidences contrary to such an explanation are not altogether convincing. A disease

[a] Later reports (April, 1917) from the *Grampus* indicate that the fishing was poor through the winter season.

seems to be a quite impossible explanation. Some geological, perhaps seismological explanation, such as Prof. Woodworth suggests, appears to be the most promising possibility.

Aside from the continued recurrence of the phenomenon in the past, we have no data on which to base a prediction as to future recurrences. In the event of a verification of the seismological-sedimentary hypothesis, a recurrence may be expected sometime. In such an event oceanographic methods should be resorted to at the first indication of the trouble; in the meantime a collection of bottom and water samples over the region is desirable, and, if possible, gas bubbles, if present, should be collected from the mud by appropriate apparatus.

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FISH ISINGLASS AND GLUE

By George F. White

Appendix IV to the Report of the U. S. Commissioner of Fisheries for 1917

FISH ISINGLASS AND GLUE.

By George F. White.

COLLAGEN AND GELATIN.

Collagen, the mother substance of gelatin, is an albuminoid which occurs to a large extent in vertebrates and also in the flesh of cephalopods. It is the chief constituent of the white fibrils of connective tissue and is also found in bones, cartilages, ligaments, fish scales, etc. Collagens of different origins are not of identical composition; however, all show the characteristic albuminoid property of being insoluble in water and the ordinary protein solvents.

The most interesting and commercially important property of collagen is its power to be converted into gelatin by heating with water alone or in the presence of dilute acids. On the other hand, if gelatin is heated to 130° C. it is transformed back into collagen, so that there is a very intimate relation between the two substances. For practical purposes we may consider gelatin to be collagen which has been converted into a soluble form by combination with water. (Other changes have been noted, such as the evolution of ammonia, when collagen is treated with water.) The following table gives the composition of collagen, gelatins from various sources, and of fish glue, which is a crude form of gelatin:

Composition of Collagen and Gelatin.

	Carbon.	Nitrogen.	Hydrogen.	Sulphur.	Oxygen.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Collagen	50.75	17.86	6.47	....	[a]24.92
Gelatin from—					
Commercial source	49.38	17,97	6.80	0.7	25.13
Tendons	50.11	17.81	6.56	.26	25.26
Ligaments	50.49	17.90	6.71	.57	24.33
Cartilage	50.34	17.76	6.96	.58	....
Trachea	....	17.87	....	.70	....
Ear	....	....	....	.66	....
Air bladder	48.69	17.68	6.76	....	....
Fish scales	....	17.51	....	.52	....
Fish glue	48.69	17.68	6.76	....	....

[a] Includes sulphur; separate percentage not noted.

Collagens are to a certain extent differentiated by the ease with which they are converted into gelatin. Thus the collagenous cartilage of the trachea is transformed at 100° C. into gelatin, whereas ear cartilage requires a temperature of 110°; the collagen of air bladders forms gelatin at room temperatures. In general, the formation of gelatin takes place most readily with fishes and amphibia, more slowly with birds, and very slowly with old animals. The presence of salts, for example, of sodium chloride in a concentration of 10 per cent retards the transformation.

Gelatin (French *gélatine*, Latin *gelata*, that which is congealed) is a colorless, amorphous substance which is transparent when in thin sheets. It does not dissolve in cold water, but swells in this medium. If treated with warm water, it dissolves to a sticky liquid which, if sufficiently concentrated, sets to a jelly on cooling. If gelatin is boiled with water for several hours (or simply digested with water for two days at a temperature of 37° C.), it is converted into a nongelatinizing form; further boiling transforms it into proteoses, peptones, and finally into acids, among which glycocoll is present in a characteristically large amount. This fact should be borne in mind in a study of the commercial uses of gelatin, since prolonged boiling, especially in the presence of acids, changes it chemically and physically (the gelatinizing) and correspondingly the adhesive power is destroyed.

As a food, gelatin has little nutritive value, and should not be substituted for other proteins of the normal diet since not all of its nitrogen is in a form which can be utilized by the organism.

Gelatin, obtained as described above, should not be confused with the products derived from algæ and seaweeds of different varieties, especially those of the East Indies, China, and Japan. Thus the gelatinizing substances obtained from bird's nests, prized as a delicacy by the Chinese, and Bengal isinglass, or agar, yield carbohydrates in large amount and have no relation chemically to true gelatin.

FISH SOUNDS.

While the principal supply of gelatin is to-day obtained from the refuse of animal bones, hides, and hoofs in the slaughter and packing houses, the peculiar properties of the gelatin derived from fish sounds, called isinglass in the trade, makes this product of considerable commercial importance.

The fish sound (air bladder, or swim bladder) is a hollow sac, containing gas (oxygen, carbon dioxide, and nitrogen), situated in the abdominal cavity below the vertebral column. Its principal function is probably mechanical. Since it is compressible, it serves to regulate the specific gravity of the fish, enabling the latter to rise

and sink or to maintain its position at a certain water level. In a few fishes it may take on the functions of the lung of higher vertebrates and may be considered to be the homolog of that organ.

The size of the air bladder varies to a great extent, being very small in some species, whereas in the sturgeon, hake, catfish, and carp it is highly developed. In some fishes the sound is practically loose in the abdominal cavity, while in others it clings closely to the backbone, the intestines, and the abdominal wall. The sound is made up of several tunics of which the inner layer is thin, often with a silvery luster, containing crystalline substances, sometimes covered with a pavement epithelium. The adjacent layer is thick and with a fibrous structure; it is the collagen contained in this layer which is the source of commercial isinglass.

Isinglass (probably a corruption of the Dutch huisenblas, German hausenblase, literally sturgeon's bladder) has for centuries been manufactured and exported from Russia. Several varieties of the sturgeon (*Acipenser huso* or beluga, *A. ruthenus* or sterlet, *A. sturio* or common sturgeon, *A. stellatus* or starred sturgeon), the catfish (*Silurus glanis*), and the carp (*Cyprinus carpio*), flourishing in the Volga and other rivers, in the Caspian and Black Seas, and in the Arctic Ocean, yield the well-known Russian isinglass.

Russian isinglass is generally brought to the great fair at Nijni Novgorod and from there finds its way, through the agency of Petrograd traders, to London and elsewhere. Other sources of supply than Russia are Brazil, Venezuela, the East and West Indies, Penang, Bombay, Manila, Nova Scotia, Newfoundland, and the United States. Russian isinglass is known in commerce as staple isinglass, and is sold as long and short staple, according to size.

Leaf isinglass (Astrakhan leaf, Saliansky leaf, Samovy leaf, etc.) is prepared by soaking the sounds in warm water, whereby dirt and mucous membrane are removed. The sounds are then opened and dried by exposing the inner membrane to the air; the dried sounds may be further treated by pounding and rubbing until the outer membrane is detached and separated from the purer, inner layer. Book isinglass is prepared in a similar manner, but the sounds are folded and covered with a damp cloth. Trimmings from the leaf or book are pressed into cakes or tablets or rolled into ribbons and sold as lower-grade isinglass. The trimmings from the sounds and other parts of the fish are often boiled in water until the gelatin dissolves and the filtered solution is evaporated to dryness. There is also cake isinglass, so called from its shape, although sometimes it is made in a globular form.

Long staple and book isinglass are the best varieties, a 2 per cent solution in hot water setting to a jelly when cold, and yielding only 0.05 per cent insoluble matter. Cake isinglass is dark colored and

of unpleasant odor. A low grade of Russian isinglass, also sold under the above names, is manufactured from the peritoneum and intestines of the fish. Russian isinglass is imported into the United States in varying amounts from year to year.

Iceland produces an excellent grade of isinglass, which is obtained from cod and ling sounds, only a little inferior to the Russian product. Venezuela and Brazil export tongue sounds and lump and pipe isinglass which are obtained from Siluridæ and other less definitely characterized fish. Tongue sounds are oblong, tapering, and pointed at one end, of firm consistency, but otherwise poorer than the Russian product. From Penang and Bombay are exported tongue sounds and also purse sounds, so-called from their shapes and their fringed edges.

The value of the imports of sounds into the United States and countries from whence imported, according to the census of 1908 (Fisheries of the United States, 1908, p. 292), are given in the following statement:

Canada	$62, 365	British India	$4, 113
United Kingdom	22, 721	All other countries	3, 863
Venezuela	13, 907		
European Russia	6, 706	Total	113, 675

The production of fish sounds in this country has fallen off in the last few years, and the demand being good the value of the imports has increased. Norwegian cod sounds have been imported at different times.

North American isinglass is derived from the sounds of hake, cod, and squeteague, hake sounds being the principal source. A few years ago over 100 tons of hake sounds were obtained annually on the New England coast alone, but the production has fallen off considerably in recent years. Large amounts are imported from Canada and Newfoundland.

Hake sounds from fish caught in deep waters off the coast of Nova Scotia are large and of good quality. One ton of these fish yields 300 to 500 sounds, weighing from 40 to 50 pounds. Hake sounds from shallow waters are smaller and of a lower grade; 1 ton yields about 600 sounds, weighing approximately, 30 pounds. Hake sounds are easily detached from the backbone in dressing the fish on the fishing vessels, and then they are salted in barrels. Before salting they may be scraped and washed but these operations are usually omitted without much injury to the character of the isinglass manufactured from them. When delivered on shore, the sounds are slit open and thoroughly washed and the black outer membrane is scraped off. They are then dried in the air with precautions to prevent access to moisture, since they readily putrefy. The average hake sound yields about 85 per cent gelatin.

Cod sounds are smaller than those of hake and of poorer quality. One ton of fish yields 15 to 20 pounds of sounds. As they are more firmly attached to the backbone than are hake sounds, they are cut off with part of the backbone, scraped, washed, and salted. They are then washed and dried on shore. Cod sounds yield only about 50 per cent gelatin, so that they are much less valuable than hake sounds.

Sounds of the squeteague, which fish occurs along the Atlantic seaboard, are at present only little utilized. One ton of fish yields about 20 pounds of sounds, which are of as good quality as cod sounds. Over 30 years ago about 15 tons of dried sounds of the squeteague were sold annually, but the production since that time has dwindled to a negligible amount.

The production and value of fish sounds in the United States as reported in the census of 1908 (Fisheries of the United States, 1908, p. 43) are presented in the following table:

	Pounds.	Value.
Maine	23,000	$1,000
Fresh	20,000	900
Salted	2,800	100
Massachusetts (fresh)	73,000	3,100
United States	96,000	4,100
Fresh	93,000	4,000
Salted	2,800	100

The sounds of many fresh and salt water fishes are at present unutilized.

TILEFISH-SOUND TEST.

The sound of the tilefish (*Lopholatilus chamæleonticeps*) was tested by the writer to determine the character of its principal constituent and its possible utility. The sound was cut open and a portion treated as follows: After thorough washing with water the tissue was allowed to stand under a large excess of 0.1 per cent sodium hydroxide solution at room temperature so that mucin, hæmoglobin decomposition products, etc., might be dissolved. The residue was thoroughly washed with water and then subjected to the action of an active trypsin solution containing 0.2 per cent sodium hydroxide for 24 hours, the temperature being maintained at 37.5° C. and in the presence of chloroform to prevent putrefaction. The tissue was largely unaffected, and after washing with water was treated successively with alcohol and ether to remove any lipoids. The residue, after drying at 70° C., was creamy white, and thin layers were transparent.

On continued boiling with water, much more quickly by the addition of a trace of acid, the treated tissue dissolved and the solution

set to a jelly on cooling. This fact, combined with its ability to withstand tryptic digestion, indicated the presence of collagen in the original tissue, and further tests confirmed this conclusion.

The collagen was rapidly hydrolyzed by pepsin in hydrochloric acid solution. It was found to be insoluble in dilute alkalies and acids but swelled in the latter on standing.

An aqueous solution of the collagen (obtained by boiling with water) was tested for gelatin as follows: The solution could not be coagulated by boiling, by mineral acids, acetic acid, lead acetate, or other metallic salts. It could be precipitated, however, by alcohol, picric acid, tannic acid in the presence of sodium chloride, or by potassium ferrocyanide in the presence of acetic acid. It gave a blue-violet biuret test, but no Adamkiewicz or xanthoproteic reaction. Millon's test gave only a slight precipitate with little color. These tests show the presence of gelatin and the absence of other protein matter.

The presence of collagen (rough experiments showed that over 90 per cent of the nitrogenous matter of the swim bladder is collagen), and the fact that it may be readily converted into gelatin allow the sound of the tilefish to be put to the same use as the sounds of the sturgeon, hake, and other fishes.

MANUFACTURE AND USES OF ISINGLASS.

Isinglass is manufactured by an exceedingly simple process. The industry was initiated in the United States in 1821, at Rockport, Mass., cleaned hake sounds being pressed into plates. In 1834 the procedure was somewhat improved, and the cleaned sounds, softened to the desired consistency by soaking in water, were converted into ribbon isinglass by being passed between solid rollers. The ribbons were then dried. In 1848 the solid rollers were replaced by hollow iron rollers, through which cold water could flow, and thus prevent the ribbons from softening and sticking to the iron, as they are apt to do, especially in warm weather. In 1873 a scraper was placed against the rollers to remove all isinglass adhering to them. The ribbons were made to the desired thickness by adjustment of the space between the rollers.

The manufacture of isinglass is best carried on through the cooler months on account of the softening and putrefying effect of a slight rise in temperature. The sounds received, generally, have been previously cleaned, perhaps scraped, de-salted, and air-dried. They are usually in a hard and tough condition, so they must be first immersed in water for several hours. Four to six hours may be required for the gelatin to absorb enough water to be sufficiently pliable to handle. The sounds may now be run into a cutting machine provided with a roller and a set of knives which chop the sounds into

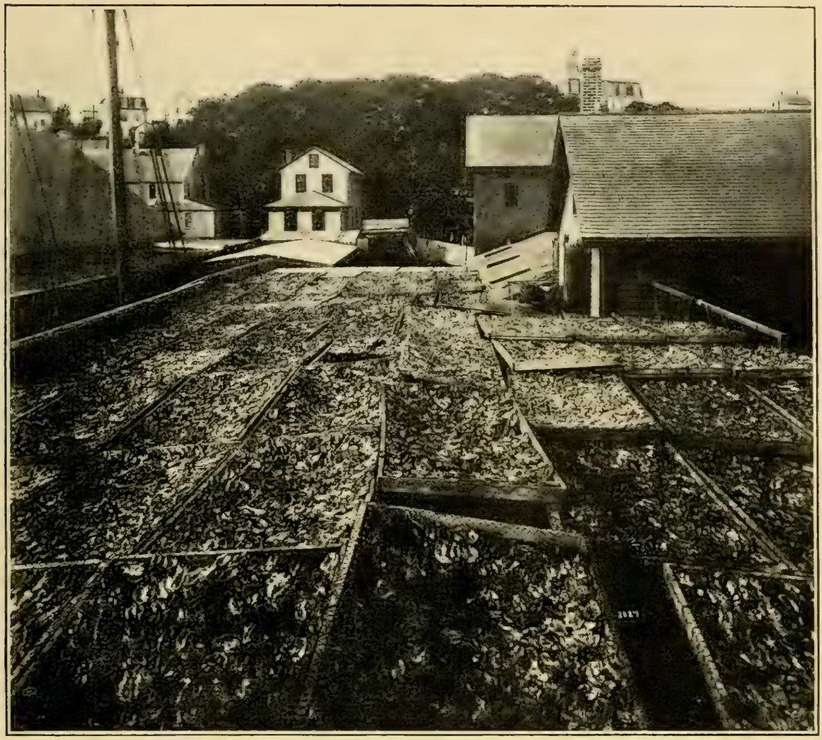

FIG. 1.—DRYING HAKE SOUNDS FOR ISINGLASS MANUFACTURE.

FIG. 2.—ROLLING HAKE SOUNDS FOR ISINGLASS.

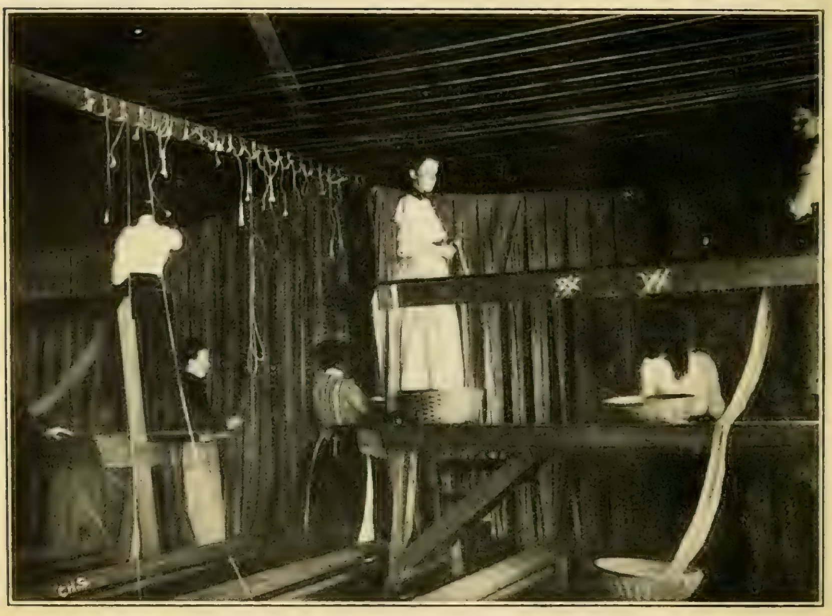

FIG. 1.—DRYING-ROOM OF ISINGLASS FACTORY.

FIG. 2.—WOODEN SPOOL FOR ROLLING INTO COILS.

small pieces. This material is then further mixed and macerated between a set of iron rollers, from which it passes to so-called sheeting rollers. These are the hollow iron rollers, cooled by water and provided with a scraper, as mentioned above. The gelatin is converted into sheets one-eighth to one-fourth inch thick, 6 to 8 inches wide, and of variable length. These sheets are finally passed through ribbon rollers until the ribbons produced are one-sixty-fourth of an inch thick; the width is the same as that of the sheets. The ribbons are dried in a few hours by being suspended in moderately warm, light rooms; they are then rolled on wooden spools into coils weighing less than a pound each. About 20 per cent of the weight of the original sounds is lost during their conversion into isinglass.

A product called transparent or refined isinglass is manufactured by dissolving New England isinglass in hot water and spreading the solution to dry on oiled cloth. Very thin, transparent sheets are thus produced, and these yield an excellent grade of glue, but retain a rather pronounced fishy odor.

When the best grades of isinglass are treated with hot water, they swell uniformly, produce an opalescent jelly, and finally entirely dissolve. Isinglass is insoluble in alcohol, but readily soluble in most dilute acids and alkalies. When ignited, isinglass should yield no more than 0.9 per cent ash, whereas poorer grades of fish glue, or gelatin, yield from 1.5 to 4 per cent ash.

Isinglass has been adulterated by rolling a layer of gelatin between two layers of isinglass. Such adulteration may be detected by treating with water and observing the nature of the colloidal solution under the microscope. Isinglass retains its characteristic fibrous structure which is not present in a gelatin solution; the gelatin becomes more transparent than before, the shreds being disintegrated. Both of these effects would be observed in the adulterated article.

The results of the analyses of some different forms of isinglass are presented in the following table:[a]

Source of isinglass.	Ash.	Water.	Residue insoluble in hot water.	Source of isinglass.	Ash.	Water.	Residue insoluble in hot water.
	Per cent.	*Per cent.*	*Per cent.*		*Per cent.*	*Per cent.*	*Per cent.*
Astrakhan	0.20	16.0	2.8	Hamburg	1.30	19.0	2.3
	.37	18.0	.7		.13	19.0	5.2
	.20	17.0	1.0	Iceland	.60	17.0	21.6
	.80	19.0	3.0	East India	.78	18.0	8.6
	.50	19.0	.4	Yellow, unknown source	2.30	17.0	15.6
	.40	17.0	1.3				

It may be readily observed that the Russian isinglass (Astrakhan) is by far the best of those samples analyzed.

[a] Prollius, I. F.: Abs. Journal of the Chemical Society, p. 647. 1884. London.

The use of isinglass for edible purposes has become practically obsolete since the manufacture of gelatin on a large scale has become a function of the slaughter and packing houses. It was formerly utilized to stiffen jellies and jams and in the manufacture of confectionery, but has no peculiar medicinal properties. Some fish sounds have been esteemed as an article of food; thus it is said that fried cod sounds have a flavor resembling that of oysters similarly cooked.

Isinglass has long been used as a clarifying agent for beverages such as cider, wines, and malt liquors. The peculiar clarifying action is purely mechanical, those substances causing turbidity becoming entangled in the slowly sinking network of gelatinous material. This property is not possessed to the same degree by gelatin prepared from animal bones, hoofs, or hides, and such gelatin is far less efficient as a clarifier. English brewers of malt liquors prefer the Penang product, while Scottish brewers employ Russian leaf isinglass. English cider manufacturers generally use Russian long staple. American brewers formerly considered Russian isinglass as superior to other kinds, but later adopted the use of the ribbon isinglass made from hake sounds in this country.

White wines are usually clarified by isinglass. The isinglass is allowed to swell in water and then in wine until it is practically transparent. It is thoroughly beaten with more wine, a little tartaric acid being eventually added; after filtering through linen it is stirred into the wine. One ounce of isinglass will usually clarify 200 to 500 gallons of wine in 8 to 10 days.

In the storage of beer after the primary fermentation all suspended particles do not settle in the stock tanks. This is true of starch granules, bacteria, some of the protein matter, etc. From storage the beer is run into chip casks where it is carbonated by charging with carbon dioxide directly or by the addition of young beer, and at the same time clarified or fined. This latter process is carried out by the addition of chips or of isinglass, or by filtration. When isinglass is employed, it is treated with sour beer, acetic, or other weak acid whereby it is not actually dissolved, but is "cut" by the acid. Finings thus prepared have an excellent clarifying action. One pound of isinglass will fine 100 to 500 barrels of beer.

Isinglass is the basis of some of the best adhesives. Although formerly used for postage stamps, envelopes, and gummed paper, the dextrins prepared from starch have largely taken its place. Mixed with two parts of alcohol a "diamond" cement is obtained, the cooled solution forming a white, opaque, hard solid. Dissolved in acetic acid another powerful cement is obtained, especially useful in repairing glass, pottery, and similar articles. Various modifications

of these cements are prepared, particularly by the addition of some adhesive gum which will render the cement insoluble in water. Following is the formula for one of these: 10 grams isinglass, 5 grams gum ammoniac, 5 grams mastic, 80 grams alcohol. The isinglass and gums are dissolved separately in the alcohol and then heated together over boiling water. The excellent properties of isinglass as a glue may be illustrated by the fact that leather belts for machinery are repaired by the use of this agent. (In the trade it is often called Russian fish glue.)

Court plaster is made with isinglass as the adhesive. The proportions used are 10 grams isinglass, 40 grams alcohol, 1 gram glycerin, and water and tincture of benzoin in sufficient amount. The isinglass is dissolved in enough water to make the total weigh 120 grams. One-half of this solution is spread in successive layers, with the aid of a brush, on taffeta stretched on frames; each layer is allowed to dry before the next is applied. The second half of the isinglass solution is mixed with the alcohol and glycerin, and is applied to the cloth in a similar manner. The reverse side of the taffeta is covered with a layer of tincture of benzoin and allowed to dry. The above quantities are sufficient to cover a piece of taffeta 38 centimeters square.

Mixed with a gum, isinglass has been used as a size for textile goods, imparting a luster and stiffness to linens and silks. Combined with water, Spanish liquorice, and finely divided carbon, india ink may be made. A patent for waterproofing fabrics has been obtained by Van Winkle and Todd (English patent 20690, 1890), who recommend a combination of isinglass and pyroxylin dissolved in acetic acid; experience has shown that a bichromate must be added to the mixture or the isinglass rendered insoluble by formaldehyde for the mixture to be successfully used. Isinglass has in past years been used to adulterate milk, the addition of a small amount adding considerably to the body.

The manufacture of isinglass in this country is rather inconsiderable as compared with the supply of fish sounds. According to the census of 1908 ("Fisheries of the United States in 1908," p. 282), the value of the annual production of isinglass in this country was reported to be $150,000, all of this coming from Massachusetts.

FISH GLUE.

Glue is gelatin contaminated usually with various decomposition products such as gelatoses, peptones, and organic acids. The purer the gelatin the better glue it yields, so that a good glue should be as free as possible from other proteins, from hydrolytic splitting prod-

ucts, and from ash. Fish glue is usually made up into liquid glue, for which there is a reasonably large demand. The manufacture of mucilage and pastes of various sorts from the dextrins obtained from starch has largely limited the demand for fish glue so that enterprises based solely on this product have not been very profitable.

The manufacture of fish glue in this country has been confined practically to three States, Massachusetts, Maine, and California, 95 per cent of the value of the product being credited to Massachusetts. For 1908 the value of the entire output in the United States was $631,000; the value of the New England output was $611,000 and of the Pacific coast output $20,000.

In New England fish glue is made from cod heads, skins and bones, haddock residues, and all fish offal containing little or no oil, as this constituent is fatal to the production of a good glue. The refuse from salting factories forms a very large part of the source of supply, as salt codfish is prepared in considerable quantities in this region. The refuse from sturgeon and the skins and scales of menhaden and herring have been used. Green and Tower[a] have shown that 1 ton of menhaden yields 20 pounds of dry scales from which $10\frac{1}{2}$ pounds of pure gelatin (containing 16 per cent moisture) may be obtained. In this connection it may be noted that the adhesive qualities of the "stick" obtained by the present methods of concentrating the waste liquors of the menhaden industry are due to the large percentage of gelatin present; this material as now manufactured has use only in the fertilizer industry, as it contains too much salt, oil, and foreign protein substance to be serviceable for glue. Many other fish residues are now unutilized; such is the case of the mullet of the southern waters, which yields an excellent quality of glue.

In the last few years whale blubber has been utilized for the production of glue. According to the German patent 131315, the blubber is chopped up, freed from most of the fat by pressing in the cold, and the remainder of the fatty matter is extracted by some solvent, as benzene. By this method all the fat is recovered and a fat-free dry residue consisting of tissue containing the gelatin is obtained, and this may be readily converted into glue.

Attempts to produce glue from the grayfish (*Squalus acanthias*) have not been successful on account of the large amount of oil and water in the fish, the difficulties attended with the extraction of the oil, and the presence of dark pigments in the skin which discolor the extracts. It is also probable that the skeleton contains only a small amount (if any) of collagen or glue-forming substance. The flesh of the smooth grayfish (*Mustelus canis*) contains gelatin-forming material and presents possibilities as a source of glue.

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[a] U. S. Fish. Com. Bull., 1901, p. 97–102.

MANUFACTURE AND USES OF FISH GLUE.

In the manufacture of fish glue the fish wastes are first washed thoroughly with cold water to remove dirt and blood from the fresh fish and salt from the salted fish. The washed material is allowed to drain, the washings being discarded, and then is subjected to the action of hot water or steam.

In the older methods of preparing glue the crude material was treated with water and the mixture boiled in open glue kettles for several hours until the collagen had all been converted into gelatin which dissolved in hot water. This method yields a fairly good glue if the raw materials are clean and fresh, but because of the lengthy time required for complete extraction the liquor obtained is usually dark colored and contains in solution many other protein substances than gelatin. Glue thus prepared is often a poor adhesive and is malodorous.

Newer methods of fish-glue manufacture involve heating the stock with steam under pressure in an autoclave so that the extraction proceeds rapidly and there is less time for decomposition of the fish protein to occur. In some plants the stock is placed in tall iron cylinders, steam-jacketed, and heated for several hours until the whole mass is thoroughly digested. By a better method, the stock is placed within the inner, perforated section of a double boiler. Steam enters the inner vessel from the outer, and the whole is heated under pressure. The glue liquor filters out of the inner vessel and may be drawn off from the outer jacket continuously. Sometimes an alternate action of steam and cold water on the stock is brought into play, and this process repeated until the extract is too dilute to be profitably worked up into glue.

The digested fish wastes may be filter pressed and the residue dried. The resulting product, containing 45 to 55 per cent protein matter, and 1 to 2 per cent oil, is a valuable by-product; in fact, on account of the demand for it, the scrap can be considered to be the main product of the industry and the glue to be of only secondary importance. At any rate, the manufacture of glue alone would not pay. The better grades of scrap are used for poultry food under the name " chum," while second grades are sold for fertilizer, for which there is always a good market.

The solutions running from the autoclaves or the filtrate from the filter presses are run into vacuum condensers, since the excess moisture in the glue liquor must be distilled off at as low a temperature as possible in order to prevent unnecessary decomposition of the dissolved gelatin. In general, vacuum evaporators consist of a spherical or cylindrical iron vessel, steam-jacketed and provided internally with steam coils immersed in the glue liquor. Sometimes,

in modern plants, a type of evaporator used has revolving steam coils; the solutions are thereby uniformly heated and undue frothing from local superheating is prevented. The distilling head is provided with baffle plates and is connected with a vacuum pump and condenser. To conserve fuel, the steam from one evaporator is led through the coils and jacket of the next in a series, on the principle of multiple effect. After concentration to the desired consistency (fish glue contains usually about one-half its weight of water) the product (fish glue) is run while still hot through cloth filters into a receiving tank.

Since fish glue generally does not yield a very good jelly when cooled, on account of the presence of impurities, it is employed as liquid glue. To prevent the glue from gelatinizing at room temperatures an acid such as hydrochloric or acetic acid is added, and the adhesiveness of the material is little affected. Since it is not required that this liquid glue be heated or be applied to hot surfaces, there has been a reasonably large demand for it. It has been largely used as a size for straw goods, especially where it has been treated with sulphurous acid, since this latter agent bleaches the straw; it is also employed as a size for textiles. Good grades of fish glue are used for court-plaster, but isinglass is a better adhesive for this purpose. The greatest demand for fish glue comes from the general demand for a liquid adhesive.

Davidowsky[a] describes the manufacture of fish glue as follows:

> The principal point to be observed in the manufacture of fish glue is the removal of the skin, which is effected by means of dilute sulphuric acid. After the removal of the last traces of acid, the fatty matter of the fishes is saponified by treatment of milk of lime frequently renewed. After washing out the lime, the pulpy mass is placed in a solution of sodium hyposulphite, alum, and sodium chloride, and left for a few days. The liquor is drawn off and replaced by a mixture of solutions of alum, dilute sulphuric acid, and nitric acid. After macerating in this mixture for a few days, the mass is thoroughly washed and boiled to a glue, and the resulting product is clarified with sulphurous acid or alum.
>
> As will be seen, the entire process requires many chemicals, and besides, the yield of glue, which has no especially good qualities, is small. It is used as a substitute for isinglass for clarifying.

That the manufacture of fish glue alone is not very profitable may be seen from the fact that glue manufacturers do not rely on this one product as a source of profit. Thus, one Massachusetts company sells large quantities of fertilizer and also cod-liver oil. Another offers to the trade glue, ink, lubricating oil, paste, mucilage, and other products.

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[a] Davidowsky, F., 1905: "Glue, gelatin, animal charcoal, phosphorus, cements, pastes, and mucilage." Translated from the German by W. T. Brannt. Philadelphia.

Lambert[a] discusses fish glue and describes its manufacture as follows:

> The fish offal is carried by conveyors to a series of washing tanks placed overhead, and thoroughly washed with water to remove the blood, etc. From thence it falls by gravitation into the digesters, and is heated with "live" steam for 10 hours. The oil and gelatinous water are drawn off by a pipe fixed to the bottom of each digester, into tanks, the oil skimmed from the surface, and the glue liquors clarified with a small portion of alum. On filtering they are concentrated in open vats provided with a steam coil, to a strength of 32 per cent dry glue, and then bleached with sulphurous acid. The residue in the digester is converted into guano.
>
> Fish glue is a light brown viscous liquid with offensive odor and acrid taste. It forms a sticky mucilage when diluted with water, and as met with in commerce, already contains about one-half its weight of water and such liquid is weight for weight, only about equal to a dextrine in viscosity.
>
> The ash of fish glue is comparatively high, about 4 per cent on body dried at 100° C. It is usually white in color, and has besides carbonates of calcium and potassium, some 5 to 10 per cent phosphate of calcium. Fish glue is said to assume a greenish-yellow color on boiling with potash and absorbs about 9 per cent of the caustic. Liquid gums of this class are easily distinguished by boiling with Fehling's solution, when they assume a violet color, and by the tannic-acid reaction. The best method to remove the unpleasant odor and taste of fish glue is to boil the solution in a little water with 1 per cent phosphate of sodium and to add 0.25 per cent of saccharine.

The offensive odor of fish glue may also be disguised by the addition of creosote, oil of sassafras or wintergreen, or other substance with a strong odor.

There have been several methods proposed for the testing of glue, none of which are perfectly satisfactory. Among the more common tests are those of the viscosity and consistency of the jelly formed. The adhesive power of the glue, however, does not depend on the character of the jelly entirely. Glue is sold with regard to its physical properties, especially its color; all fatty matter should be absent.

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[a] Lambert, T., 1905: "Glue, gelatin, and their allied products." London.

THE PIKES: THEIR GEOGRAPHICAL DISTRIBUTION, HABITS, CULTURE, AND COMMERCIAL IMPORTANCE

By William Converse Kendall
Scientific Assistant, U. S. Bureau of Fisheries

Appendix V to the Report of the U. S. Commissioner of Fisheries for 1917

CONTENTS.

THE PIKES: THEIR GEOGRAPHICAL DISTRIBUTION, HABITS, CULTURE, AND COMMERCIAL IMPORTANCE.

By William Converse Kendall, *Scientific Assistant, Bureau of Fisheries.*

INTRODUCTION.

Accurate and authentic accounts of the species of American pikes are scarce in ichthyological literature. Most accounts consist of traditions and unsupported statements interspersed with hypothetical generalities. This is partly, at least, due to the fact that in this country most students of fishes have been systematists who have had little opportunity to observe the habits of fishes, and the greater part of such information has been in the nature of more or less detached contributions and not always specifically reliable. The disjointed character and sparsity of authentic information regarding the members of the pike family provides one motive for the preparation of this paper. It does not pretend to add much new knowledge, but it affords an easy means of identification of the species and presents the supposedly well-authenticated facts, so those who have opportunities to make observations on the habits of one or more of the species may be encouraged to do so. It may lead others to verify or disprove the alleged facts and to increase our knowledge of these fishes, the value of which, now that they are becoming scarcer, is receiving recognition.

Except locally or restrictively, the pikes have been more or less regarded with aversion, especially by those who angle for the "nobler fishes," and they have acquired a reputation for voracity and destructiveness that has always been likened to those qualities in the shark. Fresh-water shark or, in the words of the poet, "tyrant of the watery plain" have always been common terms of opprobium applied to the common large species of the family. However, it is gradually dawning upon many who have previously condemned one or the other or all of the pikes that these fishes have had their special place in natural economy and that in their natural interrelations they have been no worse than other predacious fishes in theirs. It is also beginning to be recognized that there are still proper places for them in both natural and human economy.

There is no doubt but that they all possess good qualities, but the different species differ in that respect, at least in popular opinion.

Of what the peculiar virtues of each consist depends much upon the view point, as did the alleged bad qualities. For example, there have been waters in which some pike and other fishes have lived in reciprocal counterpoise from time immemorial, notwithstanding the condemned "characteristic voracity of the pike." Supposing that at some particular time the pike had been rendered less voracious, the tendency then would have been toward an undue increase of the natural objects of that voracity, which had probably been relatively as voracious on their own part in devouring the eggs and young of the pike. The increase of these forms might have resulted in the extermination of the pike, which would naturally have been reflected upon the other forms by depriving them of a part of their customary and requisite food supply, consisting of the eggs and young of the pike, and so have resulted in the decrease, deterioration, or extinction of those forms upon which the pike had exercised that quality which had been generally regarded as superlatively bad. The foregoing illustration is only a partial statement of the disturbances possible through extraneous or unusual agencies.

It is, however, a phenomenon that is usually manifested as a result of overfishing, which amounts to the same thing as depriving the pike of its voracity, and similar to what often happens when black bass are introduced into pickerel ponds, of which there are many instances, but the cause of which has not been fully recognized. For instance, it has been recognized that black bass have practically exterminated pickerel in certain waters, but why the black bass afterwards deteriorated in size and number did not seem explainable. These facts may be equally applied to other fields and fishes as respects their artificial distribution, and particularly to the members of the pike family itself, for it should be borne in mind that the reverse process of the foregoing is just as effective. If the pike should be rendered more voracious or, what amounts to the same thing, unduly increased in number, it would signify that sooner or later the food supply would be depleted, with the result that the pike would be forced to depend more and more upon its own young and would finally figuratively swallow itself.

The problem in the culture of the pikes, as well as in fish culture in general, is, or should be, how by artificial propagation to maintain a natural balance. Therefore, the common practice of placing several kinds of predacious fishes in one body of water should be abandoned. Attention should be paid to not over two species intended for cultivation and the food supply for them. Preferably, the fishes should be those natural to the waters to be stocked or, if not the natural forms, those nearest like them. In other words, species to which the waters are suited should be used, and when two species are introduced they should be of different habits, particularly the fishes that

are least likely to prey upon each other and which do not subsist upon exactly the same kind of food.[a] Again, applying the foregoing to the members of the pike family, while many of the old balances of interrelations have been upset or seriously disturbed, if due caution is exercised they may be restored or new counterpoises established.

In the following pages citations to literature are by names of author and date of publication in parentheses, indicating the publication referred to in the appended bibliographical list.

CHARACTERISTICS OF THE PIKES.

The muskellunge, pike, and pickerels are all pikes in a generic sense. There are other fishes belonging to entirely different families and, therefore, structurally different and distinct from the true pikes, which, unfortunately, have the local names of pike and pickerel. The most common species thus designated belong to the perch family. The spinous dorsal fin possessed by these fishes readily distinguishes them from the true pikes. They are more properly designated as pike perch, wall-eyed pike, sauger, etc. The "pike" part of these names, however, signifies only a resemblance, yet in certain localities the pike perch is called "pike" and in others "pickerel." This is altogether unfortunate, as it has caused regrettable confusion, particularly in compiling statistics of the fisheries.

The true pikes are characterized by having a rather long, broad, flattish snout; a large mouth extending about halfway the length of the head; the lower jaw the longer; and both jaws provided with broad bands of teeth, which are coarse and rough like wool cards and more or less movable. The dorsal and anal fins are situated near the tail and are similar and opposite. The ventral fins are abdominal.

The preceding characters serve to distinguish the pikes from the pike perches, and the following will distinguish them from all other fishes having abdominal ventral fins: Body with ordinary scales; back without adipose fin but with a single dorsal fin made up of soft rays and not preceded by free spines; anal fin without distinct spines; tail forked; pectoral fin situated below the median line of the body from tip of snout to base of tail; head more or less scaly; gill membranes not attached to the prolongation of the body forward between the gill openings; no barbels; maxillaries distinct; upper jaw not protractile, that is, its forward end is firmly joined to the snout; both jaws provided with sharp teeth, varying in size and arranged in broad bands; snout somewhat prolonged and depressed.

[a] Jardine (1898) states that in artificial carp ponds in Germany it is the custom to keep a few pike, the carp culturist knowing just how many to introduce. A few act beneficially in destroying the smaller and weaker individuals of the carp stock, which would not attain a growth in three years commensurate to their consumption of food.

The pike family includes one genus only—*Esox*, the pikes—inhabitants of the fresh waters of the temperate parts of Europe, Asia, and America. The pike proper, *Esox lucius*, inhabits all three continents and is the only representative of the family in other than the North American continent. In North America there are now recognized five species, including the pike. These are the pike (*Esox lucius*), the muskellunge (*Esox masquinongy*), the eastern pickerel (*Esox reticulatus*), the banded pickerel (*Esox americanus*), and the little pickerel (*Esox vermiculatus*).

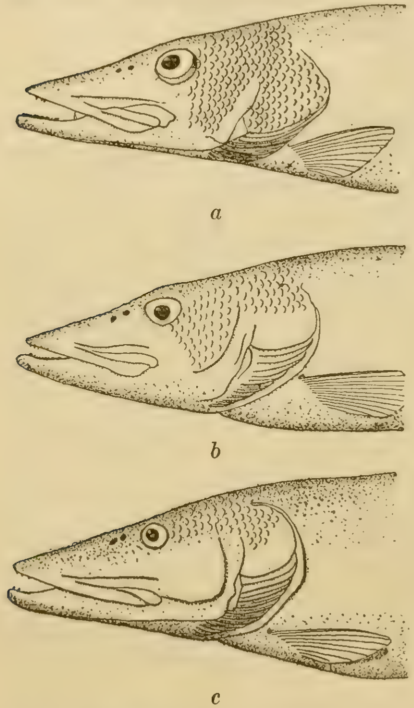

FIG. 1.—SQUAMATION OF HEAD OF PIKES.

a, Pickerel; *b*, pike; *c*, muskellunge.

The species vary in appearance among themselves according to locality, age, size, and sex, but it is only in muskellunge that subspecies have been designated, and these have been pronounced distinct species by some ichthyological authorities (Jordan and Evermann, 1902).[a]

Owing to confusion of local names, mistaken identifications, and the scant knowledge of the fishes of some regions, it has not been easy to decide positively regarding the exact geographical distribution of the muskellunge and pike in America, but the ranges of the other species have been fairly well made out.

The following key should enable anyone to distinguish any member of the pike family. In this key, however, and in the subsequent text the usual order of arrangement has not been followed, but the most important species are first considered.

The genus is divisible into three groups according to the squamation of the sides of the head, which easily separates the muskellunge, pike, and pickerels.

---

[a] Pike and pickerel, particularly the latter, have had their original geographical range more or less extended by man with both good intentions and alleged malice aforethought. Also, places in which the fish was supposed not to occur have, at one time or another, been discovered to contain them.

Jardine wrote that it had often puzzled naturalists to explain how newly made lakes or streams known to have never contained pike should suddenly have been found to be stocked with them. He added that some naturalists, including the late Frank Buckland, considered that waterfowl, such as ducks, coots, moorhens, or dabchicks, after feeding among aquatic weeds where vivified spawn had been deposited, on taking flight to other waters, conveyed some of the spawn, which is glutinous, sticking among their feathers or to their feet.

KEY TO THE PIKES.

a. No scales on lower half of gill cover (operculum).
  b. Cheek, as well as lower half of gill cover, without scales............Muskellunge.
  bb. Cheeks entirely scaled, lower half of gill cover without scales............Pike.
aa. Gill cover and cheeks both entirely scaled.
  c. Branchiostegals[a] normally 14 to 16; dorsal rays 14; anal 13....Eastern pickerel.
  cc. Branchiostegals normally 12 (11–13); dorsal rays 11 or 12; anal 11 or 12........
  ....Banded pickerel, little pickerel.[b]

MUSKELLUNGE (*Esox masquinongy*).

The muskellunge comprises three more or less distinct color forms which have been variously regarded as subspecies or distinct species.[c] These are the Great Lakes and St. Lawrence fish, with irregular blackish spots on a ground color or grayish silver (*Esox masquinongy*); the Ohio drainage fish, including some Pennsylvania and New York lakes, with dark crossbars which split up into diffuse spots (*Esox ohiensis*); and the fish of the Wisconsin and Minnesota lakes and

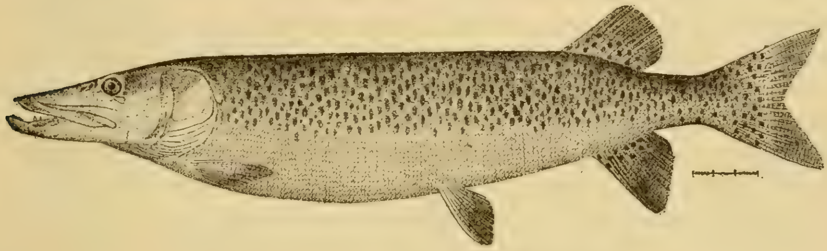

FIG. 2.—MUSKELLUNGE (*Esox masquinongy*).

rivers, with body unspotted or with vague dark cross shades (*Esox immaculatus*).

The spelling of the name muskellunge has been the subject of numerous modifications by various authors, with more or less etymological authority. Curiously enough the Cree Indian name sounds much like the French appellation (Henshall, 1892), but inasmuch as the orthographical representation of Indian sounds is somewhat a matter of individual interpretation, and as many North American French words have become greatly modified, if not wholly Anglicized, the spelling "muskellunge" is adopted here, as it is a phonetic representation of the common pronunciation whether by Cree or

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a The branchiostegals are the riblike rays under the lower edge of the gill cover.

b Inasmuch as the distinguishing differences of these two species are very slight and the geographical distribution quite distinct, the easiest method of identifying them is by locality (see discussion of each). However, the following characters have been given in keys:

A. Head $3\frac{4}{7}$ in length of body, snout $2\frac{1}{2}$ in length of head, eye 5.........................*americanus.*
AA. Head $3\frac{1}{4}$ in length of body, snout $2\frac{1}{5}$ in length of head, eye 6.....................*vermiculatus.*

At least one student who has examined many specimens of each of these species maintains his belief that they are not distinct species, and are merely subject to local or geographical variations.

c "The muskellunge of Chautauqua Lake and the Ohio Basin differs greatly in appearance from that of the Great Lakes. As the two forms are not known to intergrade and as their habits are entirely distinct, they are best regarded as distinct species." (Jordan and Evermann, 1902.)

Frenchman. In fact, the Cree name may have been an Indianized form derived from French sources or vice versa.

The most generally known form of the spotted muskellunge is native to all the Great Lakes, the upper St. Lawrence River, Lake Champlain, certain streams and lakes tributary to the Great Lakes, and a few lakes in the upper Mississippi Valley, also in Canada north of the Great Lakes. It does not seem to be at all abundant anywhere, as the number taken each year in any one of the lakes is small. It is, perhaps, most common in Lakes Michigan and Erie and among the Thousand Islands (Jordan and Evermann, 1896).

The barred muskellunge is best known from Chautauqua Lake, though specimens have been reported from a few places in the Ohio drainage—for instance, in Lakes Conneaut and La Boeuf, Pa.; the Mahoning River, and the Ohio, at Evansville— and a young individual 8 inches long was found in 1899 or 1900 by W. P. Hay in Decker Creek, above Morgantown, W. Va. (Bean, 1902a).

The spotless form is found in a number of small lakes in northern Wisconsin and Minnesota. The following waters in northern Wisconsin are stated to be inhabited by this pike: Pelican Lake, Tomahawk and adjoining lakes, Arbor Vitæ, St. Germain Lakes, Trout Lake, the Eagle waters—i. e., a chain of lakes through which Eagle River flows—Three Lakes and others connected therewith, Buckatarbon Lake, Lac Vieux Desert, Big and Little Twin Lakes, Long Lake, Sand Lake, and various others, many of which have not been explored or named (Mosher, 1892, and Nevins, 1901).

SIZE.

The muskellunge has been stated to be the largest species of the pike family, but, if traditions and reports are true, in Europe the pike has attained a larger size than has ever been recorded for the muskellunge, and there are numerous records of pike in this country of fully as large size as the majority of large muskellunge. The average weight of the muskellunge and the usual range of the large pike perhaps are not much different except in some localities where the fish have become scarce and run large. In fact in the past there have arisen many disputes and discussions regarding fish which some anglers chose to call muskellunge and which others decided were pike. Sometimes the question was referred to the Sportsman's Journal and occasionally to the United States Fish Commission. Usually, however, the description of the fish was inadequate to permit of a positive identification.

The muskellunge has been said to reach a weight of 100 pounds or more (Jordan and Evermann, 1896), but the maximum weight is probably not often above 80 pounds and the average not over 25 or 30 pounds.

Bean (1902) stated that the muskellunge in Chautauqua Lake had been known to reach a weight of 50 pounds, and in the spring of 1895, when eggs were being collected for the Bemus Point hatchery, it was not unusual to take individuals weighing from 40 to 50 pounds and many weighing from 20 to 30 pounds.

At the Minocqua hatchery in Wisconsin James Nevins (1901) mentioned one of 40 pounds.

HABITAT AND HABITS.

Habitat.—Wherever the muskellunge occurs, its habits, so far as they are known, are essentially the same and generally similar to those of other members of the family.

The seasonal abode of the fish varies somewhat with the size of the fish. In any body of water it generally occurs in the vicinity of water plants at the edge of channels or streams or along the shores, where it lies concealed.

Referring to the Chautauqua Lake fish, Bean (1908) wrote that when the lake became very clear in February the fish go into deep water and that they live in deep water more or less all of the year, and in winter they frequent nearly the same localities as in summer, usually in the vicinity of water plants.

Mosher (1892) stated that the muskellunge delight to lurk among weeds or old tree tops that have fallen into the water. There they will lie for hours perfectly motionless.

Henshall (1892) stated that like all animals of prey it is solitary in its habits, lying concealed among the water plants and bullrushes at the edges of the streams or channels or along the shores.

Feeding.—The feeding habits of the muskellunge are essentially the same as of the other members of the family. As in the case of most predacious fishes, it subsists largely upon other fishes, for which it lies in wait under the concealment of water plants. Its size makes it a formidable engine of destruction, but not more so than other voracious species of like size.

Henshall (1892) stated of the muskellunge that, like all of the pike family, it is a typically piscivorous fish, having its large mouth, jaws, and tongue, armed with a terrible array of long, sharp, conical teeth of various sizes, which form veritable *chevaux-de-frise* from which there is no escape for the unlucky fish that is so unfortunate as to be seized by the cruel and relentless jaws. In another place he went on to say that the number of fishes destroyed by a mascalonge, as he called it, during a summer is almost incredible, and they are not small fry and young fishes, such as devoured by other predacious fishes, but those that have escaped the many dangers and vicissitudes of adolescence and have arrived at an age when they are capable of reproducing their kind.

Spawning.—In referring of the Wisconsin fish Nevins (1901) wrote: "The breeding places of the muskellunge are where the logs, stumps, and driftwood are thickest, in shallow water or flowage where dead limbs, logs, and brush have accumulated as results of flooding for logging purposes or otherwise."

Bean (1908) stated that the Chautauqua muskellunge begins to spawn a few days after the ice is out and continues until the latter part of April and that it spawns in comparatively shallow water from 10 to 15 feet deep. He said that the fish does not resort to gravelly bottoms like many other fish but to mud, usually going into bays.

The following communication [a] was reported in the proceedings of the Boston Society of Natural History in 1854:

> Dr. Burnet (1854) stated on the authority of Prof. Ackley, of Cleveland, that the "muskalonge" (*Esox nobilior*) is known to perform an act of copulation in fecundating the eggs of the female. The female turning on her side offers her abdomen to the contact of the male, who, after taking a circuit, swims against her with considerable force. The female then retires and deposits her eggs in the sand, after which the process is repeated. Dr. Cabot thought that the object of the act in question might be to press the ova from the female just as they were about to be extruded. He has seen male and female suckers (*Catostomus bostoniensis*) side by side in close contact, during the breeding season, probably for a similar purpose. Dr. Durkee had noticed the same thing in the habits of the trout.

ARTIFICIAL CULTURE.

Only the State fish commissions of New York and Wisconsin seem to have made any determined effort to artificially propagate the muskellunge.

New York was first to undertake such operations, chiefly at Chautauqua Lake, and later Wisconsin carried on the work at the Minocqua hatchery.

In order to get the breeding fish, Bean (1908) stated, the pound nets are set at a number of places near Bemus Point as soon as the ice leaves the lake.

He stated that the males are smaller than the females and very little milt suffices to fertilize a large number of eggs. A female weighing 35 pounds yielded 255,000 eggs, and the eggs are about one-eleventh of an inch in diameter and 74,000 to the quart measure. They are semibuoyant and not adhesive.

Under favorable circumstances about 97 per cent of the impregnated eggs have been hatched. In the early experiments with artificial culture some eggs were hatched in 15 days with a water temperature of 55° F. The fry when first hatched are very small and quite helpless. The yolk sack is absorbed in about 15 days in water at 55° F.

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[a] Note the similarity of this description with Smitt's and Benecke's statement relating to the pike.

Formerly the eggs were hatched in boxes, but at present they are placed in glass jars and hatched like whitefish eggs in artesian-well water with a uniform temperature of about 48° F. The embryos are too heavy to swim out of the jars, and therefore they are transferred at the proper state of development to trays in boxes placed in the hatchery troughs. These boxes are fitted with wire at each end to insure a direct and uninterrupted flow of water, which prevents the banking up of the fry at the lower end of the tray. Eggs first taken on April 18 began to hatch on May 16. The shell of the egg was very dark, almost black.

Premature hatching occurred on some occasions, due to a difference of temperature between the lake and the artesian water, a difference of 7° or 8° F. when the eggs were transferred. Cold water was found very bad for hatching the eggs. They do not develop properly, some having no shell when hatched and the fry small and weak. On the other hand, if hatched in warm water the fry would be black and strong and almost twice as large. The best water to use is lake water, which should grow gradually warmer.

Mr. William Buller, of Corey, Pa., hatched muskellunge eggs on the finest wire trout trays in water at a temperature of 45° F., where they were stated to hatch in 62 days into fine and healthy fry.

Muskellunge fry can be kept very easily until they begin to swim up, but after that the losses through cannibalism are so serious that it has been found impossible to rear them.

It does not, however, swim up as soon as the young of most fishes and is much affected by the quality of the egg. Sudden changes of temperature of the water injure the egg seriously.

Young muskellunge kept in a small creek, at the hatchery grounds at Bemus Point, grew faster than those in artesian water in the hatchery troughs and ponds.

Many attempts have been made to rear the muskellunge to fingerling size, but none has succeeded on account of the cannibalism so characteristic of the young.

The young fry are usually ready for planting about the end of May or in June.

The Wisconsin commission began to propagate the muskellunge during the spring of 1899 in connection with the work of collecting wall-eyed pike ova (Nevins, 1901). The chief difficulty encountered was stated to be to catch the fish on the eve of spawning, as it was found that the large fish would not stand confinement, and in the beginning sufficient ripe male fish could not be secured.

Attempts were made to hold the fish in pens and in a large dummy pocket 20 by 22 feet and 10 feet deep, but in vain. The ova would be retained in the fish and would cake. Finally, a large pen was made in a thoroughfare between two lakes in a current of water, in which

unripe fish were successfully held until the ova matured and both spawn and milt were obtained. After spawning the fish were released. In catching the fish for breeding purposes the fyke net is usually employed, and it is not altogether an easy matter to collect a sufficient number for spawning purposes, as the spawning places to which the fish resort in pairs are scattered about the lake. In transporting the fish to the pens live boxes 16 feet long, 2 feet wide, and 10 inches deep, made "skow-shape" with bottom of slats 2 inches apart, giving an abundant circulation, are employed.

Unlike those of most other fish the eggs do not harden after being taken from the fish, but remain soft and flabby until hatched. With the water at a temperature of 52° F. the eggs hatch in about 10 days, and about 15 days are required to absorb the food sack.

Both boxes and Chase hatchery jars were tried, with the result greatly in favor of the jars. Just before the eggs began to hatch they were taken from the jars and placed on fine wire-cloth trays, in order that the young fish might not smother, being unable to make their way out of the jars unaided on account of the comparatively large umbilical sack.

One female weighing about 40 pounds produced not less than 225,000 ova, 80,000 filling a quart measure and 190 individuals averaged 6,315 eggs each.

The fry when first hatched are a light color and seem to adhere to the side of the tank, box, or tray, or any other object with which they come in contact. Those hatched were strong and healthy, grew rapidly, and in their development exhibited their wild nature and the instinct of self-preservation by quickly darting off to hide when alarmed by a person approaching the tank in which they were confined.

They were retained until they were 4 weeks old and 1¼ inches long and were fed upon young pike, which seemed to be suitable as well as acceptable food.

CONSERVATION.

Nevins stated that for many years, since the wilderness of northern Wisconsin was opened by railways and by lumbering operations, with the advent of the comforts and conveniences which the railroad takes into a new country and the encroachment of the settler and summer hotels on the primitive banks of our northern lakes, the pursuit of the muskellunge has been constant and relentless. Its utter extermination has been well nigh accomplished in many of our lakes where it was indigenous; and nearly all of our waters have been cleared of this fish to such an extent that its future has become a matter of much concern to sportsmen, fish culturists, and others interested in keeping our waters well stocked with superior game fishes.

Henshall (1892) stated that it is fortunate for the rest of the finny tribe that the "mascalonge" is comparatively a rare fish. The muskellunge, like others of the pike family, breeds in the spring, later, however, than the pike or pickerel. All of the pike family resort to overflowed marshes or shallow grassy streams to spawn—the pickerel during March and the muskellunge in May.

The pickerel thus has a start of about two months, and no doubt the young pickerel devour most of the muskellunge that hatch, for the spawn in May, in such shallow water, is exposed to the ravages of turtles, frogs, ducks, and coots, and most of it is doubtless destroyed. This seems to be a wise provision, for since the muskellunge spawns from 100,000 to 300,000 eggs, according to size, the result can be imagined were the same proportions of eggs to hatch and reach maturity as in the case of most other fishes.[a]

It has not seemed advisable to introduce this fish into other waters than those in which it is indigenous.

For a number of years the Pennsylvania commission has distributed the young of this species, hatched from eggs derived from New York waters, into natural muskellunge waters in Pennsylvania. One of the State reports says, however, that the muskellunge attains a size of 12 inches in a very few months, but to attain that size eats an enormous amount of food, causing it to be a dangerous fish to place in ordinary waters.

FOOD QUALITIES.

As in the case of other species of the family, opinions vary regarding its quality as a food fish. Henshall wrote (1892) that in comparison with the rest of the family it is a valuable food fish, though it is much overrated and is inferior to the whitefish, lake trout, black bass, or brook trout for the table, but that it is, however, readily disposed of in the markets, and, while possessing no special or characteristic flavor, is firm, flaky, and is much admired by many, and adds "but chacun à son goût."

On the other hand, Nevins (1901) stated that from a gastronomic standpoint the muskellunge has few equals among fishes and by some is considered to rank in quality next to the salmon.

AS A GAME FISH.

Henshall (1892) stated that as a game fish the "mascalonge" is far superior to the rest of the family, and when weighing upward of 10 pounds its great vitality, weight, and power give it an endurance that

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[a] In this statement Henshall does not seem to recognize that homologous adaptions exist in other fishes. In natural economy the purpose of reproduction—i. e., the perpetuity of the species—is accomplished by the survival of one pair only to replace the parents when they are gone, and for which purpose one species is no better equipped than another. Every species is naturally adapted to meet both favorable and unfavorable conditions to which it is naturally subjected. The species which is subjected to the most adverse conditions has the most eggs, and vice versa.

is highly extolled by some, but can hardly be compared to the salmon, black bass, or brook trout for pure gameness per se; that is, it does not exhibit the finesse and élan of those superb game fishes.

Most "mascalonge," however, are taken with hand line and trolling spoon and hauled in hand over hand. With taut line and moving boat the "mascalonge" sometimes leaps above the water because it can not get very far beneath the surface. As a rule, however, when on the rod it does not leave the water and will not leap unless forced to do so, but will endeavor to keep near the bottom or to reach the cover of weeds or rushes.

With proper tackle the "mascalonge" affords good sport, for, being a powerful fish, it requires much skill and judgment on the part of the angler to keep it away from the moss and grass bottom or from the weeds and algæ of the shore and to successfully bring it to gaff within a reasonable time. The best bait is a large live minnow or frog, either for casting or trolling, though for the latter mode of fishing a large trolling spoon with single hook may be used.

Regarding the Ohio fish, Henshall said that in the Ohio and its tributaries the "mascalonge" is found in the summer and autumn in the deepest holes of the streams and are then taken by stillfishing, the bait being usually suckers of a half pound or more in weight. After taking the bait the fish is given time to gorge it before striking or hooking. He adds:

> It is now, however, a rare occurrence to take a "pike," as it is called, in these waters, and the fact is talked of long afterwards and the head preserved as a trophy, while the fish itself, being esteemed a great delicacy on account of its great size and rarity, is made the piece de resistance of a formal dinner instead of being preserved for a piece justificative. For five years I have endeavored to procure a specimen of this rare fish in the Ohio Basin, but, beyond the head, my efforts have so far failed. No one who is so fortunate as to capture a "pike" seems willing to part with it for love of science or coin of the realm.

Regarding its game qualities, Mosher wrote that when lying basking in the sun they rarely take bait unless unusually attractive, but when lurking in the weeds or rushes, waiting for some living victim, they will take artificial bait voraciously. But, he stated, they do not seem to be so voracious as their smaller cousin the pickerel, and there are times when for days together no amount of coaxing will induce them to take bait of any kind.

PIKE (*Esox lucius*)

The pike, as previously mentioned, is the only species of the family which occurs outside of North America. Its geographical range, according to F. A. Smitt (1892), is from northeastern Siberia west to the east of North America. According to Pallas, it inhabits the River Amur, which falls into the Sea of Okhotsk, and the Rivers Indigirka and Chatauga, which discharge into the Arctic Ocean,

but is wanting in the Kamchatkan Peninsula. Brehm found it in the lower course of the River Obi; and in the great lakes of the Barbara steppes (the upper basin of the Obi and Irtish) it is extremely common, according to Pallas, and attains a considerable size. It occurs also in the Caspian Sea but not in Transcaucasia or in the Black Sea, though it is found in the Sea of Azov and the basin of the Danube. It is met with in rivers and lakes throughout Russia and north-central Europe, including Great Britain, Italy, and Sicily, but is said to be wanting in Greece and on the Pyrenean Peninsula. It inhabits all the waters of Scandinavia, with some exceptions in Norway.

In North America its range extends across the continent from the Labrador Peninsula to Alaska, northward to beyond the Arctic Circle, and southward to the St. Lawrence and Great Lakes Basin. It is found also in some waters in the United States south of the Great Lakes, as northern New York and the Mississippi and its tributaries,

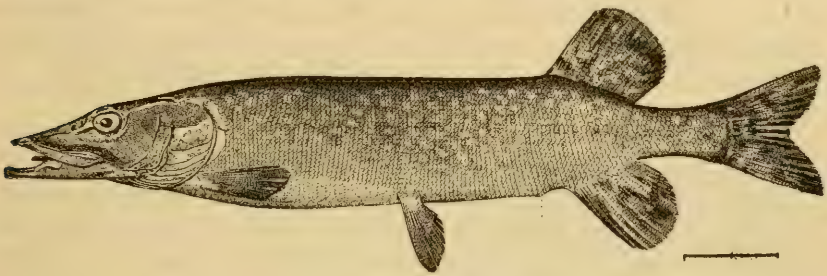

FIG. 3.—COMMON PIKE (*Esox lucius*).

but it does not occur in Nova Scotia, New Brunswick, or (except by introduction) in that part of New England east of the Green Mountains.

It is the common pike of northern New York and the States bordering on the Great Lakes.

Chambers (1896) stated that it occurs in Lake St. John and its tributary streams as well as in the large lakes adjacent to and beyond the height of land.

According to Low (1895), this fish is found abundantly throughout the interior of Labrador in the lakes and quick-flowing streams and is common in the rivers of the southern, eastern, and western watersheds, but not abundant in the Koksoak River.

Preble (1908) reported that it is abundant in the Mackenzie Valley in practically all the waters of the region and has given its name to scores of lakes and streams, but he was unable to ascertain its presence in the Ark-i-linik, Great Fish, or Coppermine Rivers. However, it is an inhabitant of the Anderson.

Bean said that Townsend and others found it above the Arctic Circle in Alaska, and Dall and Nelson took it in abundance on the Yukon.

NAMES.

In America, as in Europe, this fish is known by various names according to locality and appearance. In the British Isles the young is called a "jack" or, sometimes, pickerel. In our own country, probably, the name pickerel is in as common use for this fish as pike, and, intentionally or unintentionally, when large it has sometimes been mistaken for muskellunge. It is the "grass pike" of Lake Erie and perhaps of other waters. In Canada it is referred to as pike and jack pike. According to Forbes (1908), in Illinois and elsewhere it is called pickerel. However, with a little scrutiny, at whatsoever size, it can hardly be mistaken for any other species. The presence of scales on the cheeks and absence of any on the lower half of the gill cover easily distinguish it.

While the color of the fish may vary considerably in some details of shade or markings, as usually observed it may be said to be greenish gray with yellow reflections and with many white or yellow spots arranged somewhat in rows, the dorsal and caudal fins bearing round or oblong black spots. The young are more or less crossbarred.

SIZE.

While the muskellunge is stated to be the largest of the pike family, in Europe, if traditions can be believed, the pike has far exceeded any muskellunge record. One taken at Bregenz in 1862 was said to weigh 145 pounds, and one caught in Scotland was reported as being 7 feet long and weighing 72 pounds.

Smitt (1892) said that the maximum authentic record is one of 57.2 pounds, but that pike of that size are of rare occurrence.

Jardine (1896) presented lists covering a period from 1869 to 1896, inclusive, of large pike taken by anglers in England, Scotland, and Ireland, comprising 51 examples ranging from 18 to 37 pounds, which are found to average $25\frac{1}{6}$ pounds. He mentions another found after draining Whitlesea Mere which weighed 49 pounds.

Coupled with the alleged great size to which the pike has attained in Europe are unauthentic accounts of instances in which individuals reached a great age, as high as 200 years in some cases.

In a large lake at the head of a tributary of the Nushigak River, Alaska, the Inuit natives believe that there are pike of fabulous size which they hold in a sort of superstitious awe or fear and concerning which they relate wonderful tales, believing that they attack men in their kyaks and devour them. They say they are longer than a kyak (Fassett).

In some waters of British America the pike reaches a considerable size. Preble (1908) stated that in the larger lakes it attains a weight of 35 pounds or more. In Labrador Low (1895) said that it varies in weight from 2 to 15 pounds.

According to Chambers (1896), in the Lake St. John region many of them far exceed in weight the generally accepted limit of size of the ordinary *Esox lucius*, sometimes attaining the weight of 20, 30, and even 40 pounds. One was taken in Lake Tschotagama in 1890 which weighed 49 pounds and another in 1891 of 47 pounds. In 1892 one was caught in the Peribonca River which weighed 35 pounds.

Herbert (1849), referring to the pike, said that specimens of the northern pickerel may be found which weigh as high as 16 or 17 pounds, but that weight is rarely exceeded.

Forbes (1908) stated that the average weight of the pike in Illinois waters is not over 5 pounds, but a specimen weighing 26½ pounds was reported by Dr. Jordan to have been caught in the Kankakee, and Tomlin (1892) wrote that specimens have been taken in Michigan and along the bays connecting with the north shore of Lake Superior which weighed as high as 20 pounds.

HABITAT AND HABITS.

Habitat.—The pike chooses its spring and summer haunts by preference in shallow inlets with weedy bottoms and shores overgrown with reeds and rushes. Toward autumn it betakes itself to precipitous, stony shores, which it again forsakes when winter is at hand and the inlets freeze. Most of the pike then return to their summer stations, but the larger ones seemingly follow the shoals of other fishes to the depths, being seldom caught during the winter in shallow water. For these a more plentiful supply of food is, no doubt, necessary than shallows afford in winter. When the pike has chosen its station for the season, it restricts its wanderings to the immediate neighborhood, leading a solitary life and never being seen in company except during the spawning. (Smitt, 1892.)

According to Preble (1908), in the far North it is much less common in the muddy rivers than in clear lakes, and the pools at the foot of falls or rapids are favorite haunts. Forbes (1908) said it prefers clean, clear, cool water with a sluggish current, in which it remains generally quiet by day.

Habits.—Tomlin (1892) wrote:

> It is a powerful fish and is no coward; it will fight as viciously as a terrier. We have seen small pike with jaws locked and lashing the water around them like a boiling caldron. Occasionally letting go and backing out, they would rush at each other with open jaws and keep up the fight until one is beaten and driven away or until later on exhausted. Some years ago I found two dead, with both jaws fast set so that they could not be pulled open. Both of them were handsome male fish and must have fought fiercely, for their bodies were cut all along the sides and bellies.

Feeding.—The pike is undoubtedly the most voracious among the fresh-water fishes. It devours indiscriminately other fishes, young waterfowl, small mammals, and carrion. From the dense bed of grass or rushes, where it usually passes the day in stationary watch,

it pounces with the speed of an arrow on its unwary victim. It almost always seizes its prey crosswise and retains its hold until the latter is dead or so exhausted as to desist from all struggles. Then the pike turns the prize in its jaws till the head points toward the interior of its mouth and commences its meal. This operation is a protracted one when the victim is large, for the end first swallowed and received in the stomach must digest to make room for the remainder (Smitt, 1892).

On one occasion a pike of 7 or 8 pounds' weight was seen to dart forward and seize a salmon which was quite as large in its formidable jaws right across the body. The combat was fierce. The salmon leaped out of the water and made desperate but fruitless struggle to shake off its relentless captor. In a couple of hours' time the salmon was utterly exhausted, and the pike began to swallow it head first. The meal lasted three days before the whole body had disappeared. The process of digestion must have taken much longer, for all the following week the pike had a very swollen appearance and could hardly be induced to move by touching it with a long stick (Smitt, 1892).

The fishermen in general believe that at certain seasons of the year the pike entirely abstains from food and at others is excessively voracious. These seasons are said to be periodical and regular in occurrence, the observant fisherman being able to predict the time when the pike is "on its feed," as it is called. But these periods are said not to occur at the same time year after year, and according to some observations, they are determined by the spawning season, for the period of voracity begins in the same change of the moon (waxing or wane) as the pike finishes spawning. There is one exception, however, the pike being always "on its feed" throughout the dog days. This periodical voracity and moderation is said to depend on the circumstance that at certain times the points of the teeth hardly project above the flesh, some tenderness of the gums being thus the curb of the pike's usual rapacity. Perhaps we have here some observation on the manner in which the pike casts its teeth or we may find a more probable explanation in the fact that the fish requires some time to digest the great quantity of food which it devours during the period of voracity (Smitt, 1892).

According to Chambers (1896), in the Lake St. John the fish is so voracious that many of the settlers about the shores fear to bathe in the waters. Both dogs and waterfowl swimming upon the surface have been attacked.

Forbes (1908) stated that it is purely carnivorous, its food consisting of fishes, such as sunfish and black bass. Frogs, crayfish, large water insects, mice, reptiles, and young ducks have been reported by various authors to have been taken from the stomachs of pike.

Breeding.—Since, unfortunately, not much has been written concerning the breeding habits of the American pike, it is again necessary to rely for information mainly upon what has been published respecting the European fish. However, if the two are specifically identical, the general habits are probably much the same.

Smitt (1892) has quite fully described the spawning process of the Scandinavian pike, and his description essentially agrees with the account of the German fish given by Benecke.

In the spring before there is open water in the lakes the pike commences to approach the shores, and breeding individuals in particular repair to those parts of the shore having inlets. When the spring is so far advanced that the lakes are free of ice, the brooks clear, and the low-lying meadows about the shores are under water, the larger pike make their way to those inundated places and begin to spawn.

The spawning is of long duration, its season depending upon the age of the fish, the young spawning first. When they have finished, the middle-sized pike begin, and the oldest and largest spawn last of all. Generally there are laid about 100,000 yellowish eggs about 3 millimeters in diameter, out of which in the course of 14 days the young with their great umbilical sacs escape. The spawning time in eastern Prussia was given as during the months of February to April, and occasionally the spawning of the first pikes occurs before the departure of the ice. (Benecke, 1880 and 1885.) In Illinois the pike spawns in March, selecting shore water about a foot and a half in depth, and the young hatch in about 14 days (Forbes, 1908).

Benecke (1880 and 1885) stated that it lives a hermit life, consorting in pairs only during the spawning season, but Smitt said that the females, which are always larger, come to the spawning places each attended by two or three or, in rare cases, four males; also that the females swim so high in the water that when the weather is calm the surface is faintly rippled by their movements and the dorsal and caudal fins may be seen above the surface. As soon as the female halts the males approach and surround her, one on each side or, if more than two, one under the tail and perhaps one above the back. They rub themselves against her body, during which operation she keeps still, only moving the fins, after which she disperses the males with a sudden lash of her body and darts to another point, meanwhile having deposited in the grassy bottom the yellowish and coarse-grained roe which is impregnated by the milt. At the new location the operation is repeated. Benecke, however, states that the fish rub violently against each other and the spawn is deposited, accompanied by powerful blows of the tail.

The number of eggs yielded by a pike, of course, depends upon the size of the fish. Pennel (1886) stated that a pike produces about 80,000 eggs, while Jardine (1898) placed the number at 100,000. Bloch counted in a pike weighing a little over 6 pounds 136,500 ova,

and Buckland found in a female weighing 28 pounds 292,320 eggs and in another weighing 32 pounds 595,200 (Smitt, 1892).

According to Smitt (1892), the eggs, which at first are rather adhesive, lie free on the bottom and in the spring (April) require about three weeks to hatch. Jardine says that the period extends from one to three weeks according to the temperature of the water.

Notwithstanding the great fecundity of the pike, Smitt was of the opinion that a great portion of the deposited roe is probably destroyed, committed as it is to the open waters, where it is exposed to many dangers.

The newly hatched fry, wrote Sundevall (Smitt, 1892), is short and thick in shape with rather a large belly. The coloration is yellowish but quite transparent and densely punctated on the surface with black dots, a dark band running from the eyes along the sides of the belly.

At first the larva remains almost quiescent, lying close to the surface of the water beside plants and floating straws and the like, to which it seems, as it were, to hang, or else at the bottom in less than an inch of water. On being touched it swims rapidly about with hasty movements of the tail but soon resumes its former position. In about 10 or 11 days the yolk is absorbed and the belly much reduced in size but the head elongated and the mouth large. It now begins at once to swim more steadily, in the same manner as its elder, and goes in quest of prey. It soon abandons the habit of lying on the bottom or resting alongside floating objects, repairs to somewhat deeper water, remaining for the most part stationary, as if on the watch for prey. It seizes small fishes and other aquatic animals of a size considerable enough in comparison with its own, but only leaps for those which it sees moving, just as in the case of older pike (Smitt, 1892).

RATE OF GROWTH.

According to Smitt (1892), the external form in which the specific characters of the pike may be traced seems to be fully developed at an age of nearly 2 months and a length of about a Swedish inch (25 mm.). Subsequently the growth proceeds rapidly, as usual, at first, but with very considerable variations, depending on the different supply of food under circumstances favorable in all respects. According to some observations a 1-year pike is only 15 centimeters long, according to others 30 centimeters. Blanchere states the growth as follows:

MAXIMUM LENGTH OF THE PIKE.

	Meters.
1 year old	0.25–0.30
2 years old	.36– .42
3 years old	.55– .60
6 years old	1.00
12 years old	1.35

How widely such computations may differ appear from Ekstrom's observations. He found that pike fry 37 to 49 millimeters (about 1.45 to 1.90 inches) long, kept in a spring with muddy bottom, only attained in 5 years the size of a common herring, but that a specimen 15 centimeters (about 5.88 inches) long, kept in another spring with smaller fish to feed on, attained in 5 years a length of 4 decimeters (about 15.70 inches).

Whitmark gave a number of statements from authorities in different parts of Germany showing the annual rate of growth of the pike, which appears to vary from 2 to 3 pounds, the maximum size attained being from 40 to 70 pounds. He cited one instance in which, in two summers, a few individuals liberated in a pond full of a species of carp grew from the weight of 1¾ to that of about 10 pounds.

Frank Buckland was of the opinion that pikes did not become egg-bearing under the weight of 3 pounds (Jardine, 1898).

CULTURE AND CONSERVATION.

Notwithstanding its growing scarcity, the idea of any need of culture or conservation appears not to have been generally entertained. Apparently no attempts at artificial propagation have been made.

In the words of Forbes (1908), this noble fish, completely and almost ideally equipped for the predatory life, has now nearly disappeared from the larger and muddier streams of Illinois, but it is still found in abundance in the headwaters of the Kankakee and in the small glacial lakes of the northeastern part of the State.

Chambers (1896) regarded it as fortunate that in many of the Lake St. John waters, where it has been systematically fished during recent years, the pike is very much less abundant than formerly.

In New England, about 1838, the fish, it seems, was transplanted from Lake Champlain into a pond connected with Black River, Windsor County, Vt., and thence carried by a freshet into the Connecticut River. In 1846 Dr. Storer (1848) reported the capture of this species in the Connecticut River, a specimen having been sent to him by Mr. William Henry, of Bellows Falls, Vt. Mr. Henry reported that he had known, in some seasons, 100 or more to be taken at Bellows Falls, weighing from 1 to 14 pounds each.

There are probably other instances of its having been transplanted, but its artificial propagation has not been encouraged in this country. However, regarding the British pike, Jardine (1898) wrote that inland lakes, ponds, and brooks were lying useless and pike would well repay cultivation in them, for they grow and fatten with great rapidity.

FOOD QUALITIES.

As a food fish the pike is of no small value. The flesh is white, firm, wholesome, and comparatively free from bones. Fresh pike is by no means a bad dish, and the flesh has advantage over that of

many other fishes. It may be kept for a long time, without deteriorating, in a salted or dried condition.

Herbert (1849) said that it is coarse, watery, and of small value on the table.

Preble said (1908) that in the Athabasca and Mackenzie region, a region of excellent food fishes, it is not highly esteemed, but being easily captured it is often a means of preventing much suffering from famine.

Benecke (1880 and 1885) stated that only the young rapidly growing pikes are edible, the old ones being dry and tasteless.

Jardine (1898) cited the "Analysis tables of the food collection" at Bethnal Green Museum in support of his statement that the pike is a nutritious food, containing more nitrogenous or muscle-forming qualities than meat, and he added that as an adjunct to the domestic bill of fare a small pike from 5 to 8 pounds' weight, caught during November or the next three months, when fat and nicely cooked, is a dish by no means to be despised.

AS A GAME FISH.

Go where pike can be found, fish for them with legitimate tackle, give them a fair chance, and they will afford as much pleasure as any royal smallmouth bass that ever swam (Tomlin, 1892). Cheney (1896) wrote that the pike and pickerel had not been hatched in this country, but that the pike was cultivated in Germany by artificial methods and is regarded more highly in Europe than in this country. He explained that the reason for this is that we have such a great number of so-called game fishes considerably superior to the pike that the latter has been relegated to an inferior position. However, the pike has its loyal adherents who regard it highly as a rod fish and as a table fish.

EASTERN PICKEREL (*Esox reticulatus*).

The eastern pickerel has a comparatively limited natural geographical distribution. It is believed originally to have been restricted to the fresh waters of the Atlantic seaboard, being commonly found everywhere east and south of the Allegheny Mountains from southwestern Maine to Florida.

Aided by man its range has been extended throughout the southern half of Maine and even farther north into the lower waters of the St. John River, into New Brunswick, and elsewhere. Thompson (1842 and 1850) did not record its being found in Lake Champlain, but stated that it was the common pickerel on the east side of the Green Mountains, as *Esox lucius* was on the other.

However, it has since been reported in Missisquoi Bay (Evermann and Kendall, 1902) and in the St. Lawrence as long ago as 1863

(Fortin, 1864). It has also been recorded in one locality in Lake Ontario (Evermann and Kendall, 1901).

Occurring as it does so commonly in the St. Lawrence, it is peculiar that it is not more common in the northern tributary waters, but Halkett (1913) does not definitely record it at all, and Nash (1908) states that he has not met with it elsewhere than in the neighborhood of Toronto, where he has taken a few specimens.

LOCAL NAMES.

A common book name given this pike is chain pickerel, but in New England it is almost if not quite invariably known as pickerel. It is, perhaps, the grass pike of the St. Lawrence and the green pike of some other localities. It is commonly called jack in the south, the term being probably an early importation from England, where small pike are often so denominated. Smith (1907) mentioned pike, red-

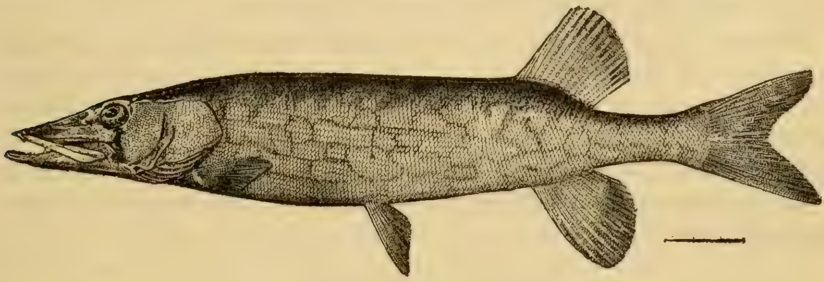

FIG. 4.—EASTERN PICKEREL (*Esox reticulatus*).

finned pike, black pike, duck-billed pike, and jack as names in common use in the Albemarle region of North Carolina. He explained that old specimens living in deep, shady water were designated as black pike by the commercial fishermen. Bean (1902) said it is the federation pike of Oneida Lake, N. Y.

CHARACTERISTICS.

The scales on the cheeks and opercles easily distinguish this fish from the muskellunge or pike, but not from the other two species of pickerel. From these the adult may be always distinguished by the reticulated black or brownish lines on the sides. Younger fish do not show these marks, but are also banded, the cross bands being wider and, consequently, fewer than in either of the others. The structural distinguishing characters have already been indicated. A well-conditioned pickerel, with its green and golden hues and dark markings, is a beautiful fish.

SIZE.

Ayres (1844) gave an account of phenomenally large examples. He said that on February 28, 1842, he examined a pickerel which had been caught in the Hockanum River, about 2 miles east of Hartford,

Conn., which he claimed was "an undoubted *reticulatus* of Le Sueur." It was 38 inches in length and weighed 14 pounds. He stated that this was the largest example of the species which had ever come under his observation with one exception. The largest of which he had ever heard as occurring in the Eastern States was taken in the spring of 1842 near Greenfield, Mass., which weighed 20 pounds. These might be accepted as authentic records were it not for the fact that the introduced pike had become fairly common in the Connecticut River in 1846 in the vicinity of Bellows Falls, Vt., and had found its way down perhaps into these tributaries. This fact lends an element of doubt to the question, preventing acceptance of the records as authentic, although Dr. Ayres was an accomplished ichthyologist. However, ichthyologists have been known to make worse mistakes.

Storer (1853) said that the largest pickerel seen by him were specimens weighing 7 pounds brought from Brewster, Cape Cod. Even larger ones were reported to have been found there.

Pickerel weighing as high as 8 pounds have been authentically reported, but such size is uncommon and fishes accounted large will not usually exceed half that weight. Two and three pound pickerel are about the average in waters of ordinary suitability to the fish. However, bodies of water differ in respect to their suitability, and in some the largest fish will not exceed a pound and in others much larger fish are common.

HABITAT AND HABITS.

Habitat.—The usual haunts of the pickerel are weedy streams and bays or coves of lakes. In some lakes small and medium sized pickerel occur in the shallow coves, where they lurk under lily pads or amongst the rushes and sedges. Often larger fish occur along rocky shores contiguous to deep water, especially if there are fallen trees, brush, or bowlders to afford concealment. It has, also, been caught on the rocky shoals of an open lake.

In some streams, while it is most abundant in the sluggish, dead waters where aquatic vegetation is profuse, it is not infrequently found well up in quicker water if the character of the shores or growth there provides concealment.

In North Carolina, Smith (1907) stated that its favorite haunts are creeks, coves, and bayous containing grasses and broad-leaved water plants, under which it lurks.

Where natural or artificial obstructions do not exist, the pickerel will sometimes make its way to extreme headwaters. Adult pickerel a foot in length have been taken near the spring source of a stream where it was not over 2 feet wide and only a few inches deep, but full of pondweed. However, pickerel will not often traverse rapids or long extents of rips, and those found far upstream, as just de-

scribed, probably reached those places for self-protection while young fish. The very young, just as in the case of many other fishes, find their way into the shallowest waters and mouths of brooks entering the lake, probably from neighboring localities where they were born.

According to Mr. Frank Todd, of St. Stevens, New Brunswick,[a] a few years after the introduction of pickerel into the St. Croix Lakes, for a number of years a good many individuals of large size were taken by weirs and by hook in salt water some 6 or 8 miles below the head of tidewater. At the time of writing, however, some 15 years since the introduction of the fish into that region, they had greatly decreased coincidentally with the pickerel of the fresh waters.

Food and feeding.—The principal subsistence of adult pickerel consists mainly of other fishes, although it includes many other animals in its bill of fare, such as frogs and other batrachians or, in fact, any living thing moving in the water within reach which it can capture and handle. According to Smith (1907), in the spring about Albermarle Sound, this fish feeds chiefly upon alewives.

Like other members of the family, this pickerel is accounted an extremely voracious and destructive fish, but it is seldom found gorged with food, as is the salmon and trout, although it sometimes proves itself successfully ambitious respecting the size of the object it swallows—swallowing, as it were, on the installment plan. When ravenous, it does not hesitate to seize a fish at least half as large as itself or so large that a portion of the fish may be seen protruding from the pickerel's mouth as the remainder is being digested in the stomach. In Umbagog Lake, of Maine and New Hampshire, of numerous pickerel examined, those that contained any food at all usually had small suckers. Three pickerel—11, 12, and 15½ inches long—caught in a stream in the vicinity of Freeport, Me., contained only aquatic insect larvæ. A 2-pound pickerel caught at the mouth of Sebois River, a tributary to the east branch of the Penobscot in Maine, contained a hornpout (*Ameiurus nebulosus*) about 4 inches long, and in one weighing 2½ pounds, taken in the Wissatoquoik Deadwater of the east branch, was found a smaller hornpout.

The character of the food of young and adolescent pickerel may be inferred from the following examples: At Sebago Lake two pickerel about 2⅓ inches long each, contained small insect larvæ and small crustaceans, and one about 5.8 inches in length had only a tiny fish in its stomach. One less than 2.5 inches long contained a young sucker, apparently partly digested, about one-half an inch in length. One about 3.2 inches in length contained one sunfish (*Lepomis gibbosus*) about nine-tenths of an inch long, swallowed head first, and one 4.7 inches in length had fed upon nothing but insect larvæ

[a] Forest and Stream, vol. VIII, June 21, 1877, p. 320.

and amphipods, small crustaceans very common in the brook in which the fish were found. At Umbagog Lake many young pickerel ranging from 2 to 4 inches long were found to be feeding exclusively upon Entomostraca and insect larvæ.

Of eight examples, from 4.25 to 6.37 inches in length, caught at the same time and in the same place, six contained fishes, four of which were young pickerel. Of another lot a 4.25-inch fish had also a young pickerel 3 inches long in its alimentary tract; one 5.37 inches long also contained a pickerel 3 inches long; another 5.87 inches long, besides other things, had a pickerel 2.06 inches in length in its stomach; still another 5.62 inches in length contained two small minnows; one 6.37 inches long had in its stomach one pickerel 3 inches long and one shiner 2.5 inches in length; and another 7.5 inches long contained a 1.5 inch hornpout. Other instances were those in which one 7.5 inches long contained the head of a small chub and one 9½ inches long had a 2.3 inch pickerel in its stomach.

The foregoing suggests a cannibalistic tendency even in very young fish, which is maintained throughout life owing to the previously mentioned fact that, when feeding, the pickerel will attack any accessible moving object. Pickerel, however, are not always feeding, and apparently go without feeding for periods of days, or at least, during the time in such periods as they are under observation. Probably, its hunger having been satisfied, like many other fishes, it refrains from eating for a considerable period. When it takes its food it does so with a rush, and if the food is a fish the pickerel grasps it crosswise, then stops and works its victim around so that it is swallowed head first.

Breeding.—The breeding places of the pickerel are shallow coves, mouths of inlets, approaches to outlets, and sometimes in overflowed areas, in water from 3 to 10 feet deep, but not always in the same places each year. Sometimes the eggs are deposited among the roots of submerged tree stumps, the branches of fallen trees or bushes, water plants, and occasionally on gravel or in the crevices among rocks. Here, according to Tomlin (1892a), the fish are found in pairs, gently swimming to and fro, rubbing side by side until the female is ready to spawn. Similar to the perch, the eggs are laid in glutinous strings of a yellowish-white color, which often form large masses and have been seen clinging to submerged bushes in great mats or long strings. Strings of pickerel eggs observed by the collector of the Pennsylvania Fish Commission (1907) were said to average from 2 to 9 feet in length. Most published statements regarding the spawning time of pickerel are rather indefinite, as in "winter and spring." It is quite possible that southward it does spawn in late winter. However, the report of a commissioner of Massachusetts (1870) stated that Mr. Stone found

the pickerel ripe in the beginning of May. In Pennsylvania they were found to begin to spawn from the middle of April until the early part of May, depending upon the locality and season.

The female fish appear to preponderate over the males, according to observations cited by the Massachusetts Fish Commissioners (1870):

> This fish, to its other disagreeable and contrary qualities, adds the tendency to multiply females, whereby the spawn crop is increased. Among many individuals examined last spring it was rare to find a male, not oftener, certainly, than 1 in 14.

RATE OF GROWTH.

The rate of growth of the pickerel, like that of any fish, depends much upon the available food supply and to some extent upon the temperature of the water. Tomlin (1892a) said that as soon as they are able to take care of themselves they show the family likeness and begin their bold predacious attacks upon the fry of the silver chub and shiner family.

The Massachusetts Fish Commission reported (1870) that its rate of growth seems to vary with the temperature. In a pond fed by a large spring brook, when there was enough food but cold water their growth seemed slow. In support of the statement the following table was given:

Age.	Length.	Weight.
	Inches.	*Ounces.*
1 year	4.5	0.5
2 years	7	1.5
3 years	10	4
4 years	13.5–14.5	8–12
5 years	17.5	24
6 years	20	40

On the other hand, it was stated that in a large warm pond, covered with lily pads and full of young alewives, pickerel have reached 4 and 5 pounds in three years.

FOOD QUALITIES.

As a food fish it is variously esteemed, by some being regarded as an excellent fish and by others as decidedly inferior. In regard to this, it may be said that much depends upon conditions. A pickerel of moderate size from fresh cool water is not to be compared with one that has lain all day in the sun or a week or two in cold storage or a day or two on the market stand.

Storer (1853) said: "This fine species is the common pickerel of Massachusetts * * * and is everywhere valued."

Bean (1902 and 1902a) said that as a food fish not much can be said in praise of the chain pickerel, though it is eaten by some and

liked by a great many people, and, again, that in some parts of New York it is little esteemed, but in other portions of the State it is considered a fairly good fish and furnishes sport for the angler.

Whatever its food qualities, it is persistently sought throughout the year in localities where no restrictions are placed on the fishing and everywhere throughout the prescribed open season and is a common fish in some markets of the East and South. Smith (1907) stated that in North Carolina considerable quantities are marketed, but it does not rank high, the flesh being coarse and filled with minute bones.

In the writer's experience the pickerel has always been found to be an excellent fish when fresh from Maine waters and properly cooked. While small fish might be objected to on account of bones, he has not found them more troublesome in that respect than in many other small fishes.

PROPAGATION.

It appears that only the Fish Commission of Pennsylvania has ever considered the pickerel worthy of artificial propagation. Attempts were made in that direction as early as in 1901, but it was not until about 1905 that much success was attained. The reason for the attempt at artificial propagation of the pickerel is stated in the annual report of the commissioner (William E. Meehan) for 1905, pages 57–59 (1906) as follows:

> Between 40 and 50 years ago nearly all the sluggish waters in eastern Pennsylvania teemed with pickerel, especially the streams near the border line of New Jersey. Three-fourths of the natural mountain lakes also contained large numbers of this fierce but excellent food fish. The pickerel in the streams were soon wiped out, so that 25 years ago it was rare to find a pickerel in any of this type of water, except occasional "strays." With very few exceptions there has been a rapidly diminishing supply in the mountain lakes. Destructive methods of fishing undoubtedly have been the one potent cause for this marked reduction, another was that no efforts were made to restock.

At first vain attempts were made to retain pickerel in ponds or pens until they became ripe and to retain them afterwards as breeders, but it was found impossible to supply them with the required living food. Therefore, they began to search for their eggs where the pickerel had deposited them naturally. These were collected and conveyed to the hatchery, where they were placed in hatching jars. At first the Downing jar was used, but later one devised by the commissioner himself, which was found to be more effective. The jars were arranged in the form of "batteries," as in the case of whitefish or perch.

It was stated to have been found to be remarkably easy to hatch pickerel eggs, as only a very small flow of water was required. However, constant vigilance day and night was necessary, for as soon as the

eggs began to eye they became semibuoyant and often bouyant, and unless prevented the eggs would have flowed out of the jars into the troughs and been lost. This the whole batch was liable to do in a few minutes. The flow of water through the jars must be barely enough to slightly move the eggs. It was in permitting this gentle flow that the Meehan jar was an improvement over the Downing jar, which required considerable force of the water to operate.

Although a strong flow of water was impracticable and a light flow necessary, the latter had to be augmented by some stirring of the eggs in order to prevent their smothering just before the hatching period. This was accomplished by occasionally rotating the glass tubes that supplied the water, thus producing better circulation and a change of position of the eggs.

The eggs were found to hatch in about a week or 10 days, varying somewhat with the temperature of the water, and were found to hatch equally well whether they came into the station clean or dirty. It was found that it was very injurious to attempt to wash the eggs when brought in. They had to be placed in the jars together with what sticks, weeds, etc., were clinging to them. At first in transporting the eggs from the lake to the hatchery cans were used, but later the eggs were retained in floating boxes until the conveyance came for them, when they were packed in egg cases and carried to the hatchery.

It seems that after 1910 pickerel propagation practically ceased in Pennsylvania. To indicate, however, the magnitude to which it had attained at that time, it may be said that in 1909 there were distributed 300,150,000 pickerel fry and the number in 1910 amounted to 226,100,000. In 1914 the only distribution of this species was 85 adult fish.

CONSERVATION.

In some States the pickerel has always had more or less nominal protection of the law. In some, perhaps it may be said in most, communities pickerel fishing has been a favorite pursuit of local residents, particularly in winter, both for the sport and for their tables. In the North pickerel was formerly caught to some extent for the market. However, in all localities there have been those who derogated the fish to the lowest degree. These were usually anglers who preferred other fish and fish culturists who believed that to all the allegations regarding its rapacity and destructiveness much more that had not been said could be added were their language adequate. Even to-day fish culturists have inherited the ancient beliefs and antipathies against the pickerel, which were based upon a small amount of truth and a great amount of fallacy.

But there have always been and still are those who want pickerel fishing and demand its protection and some who have wanted and those who now want the fishing without the protection. Some of

these facts are at the bottom of stated antagonistic beliefs and recommendations. The intricacies in politics involve even the fishes of the waters. One State fish commissioner's report calls attention to "much dissatisfaction regarding ice fishing. Many of our best sportsmen claim that the fishing for pickerel in waters that have been closed for a number of years is not as good to-day as before they were closed, different theories being advanced as to the cause."

Those interested in the pickerel and pickerel fishing have been forced to recognize that in a great many if not nearly all pickerel waters, where they once abounded and attained a large size, they have diminished in numbers and deteriorated in size. One or two examples will serve as illustration of facts well known, at least locally. As long ago as 1898 the writer made some observations and inquiries at Sebago Lake, Me. There an old resident fisherman informed him that pickerel were once abundant and of a much larger size in the lake and some of its tributary waters. By winter ice fishing they still caught some pickerel in the lake. Fish weighing 3 or 4 pounds each and the year before one of 7 pounds had been caught, but such fish were seldom seen in recent years. The lower part of the Songo River also harbored many large fish, but at this time one much over a pound in weight was a rarity. The pickerel observed by the writer in this place were small, poor, and often greatly emaciated, a fact that was surprising inasmuch as small minnows were very numerous in the so-called "bogs" or bayous where the pickerel were found. This latter fact is not easily explained, but the scarcity in both lake and Songo waters may be accredited to excessive fishing, particularly in the winter and in those days when market fishing was permitted. This was possible, notwithstanding the large size of the lake, owing to the fact that congenial pickerel waters in the lake were limited in number and restricted in area. The pickerel is supposed to have been indigenous to Sebago waters. Another lake in which pickerel were introduced may be cited as an example of deterioration. This is Umbagog Lake, the lowermost of the famous Rangeley chain of lakes. Umbagog is the only one inhabited by this fish, where they are reputed to have once been abundant and of large size, but as early as 1883 there were complaints of growing scarcity and the small size of the fish caught. To all appearances the conditions are ideally favorable for pickerel, which is supported by the fact of their former increase in number and size. Observations made there in 1905 by the present writer indicated that the claims of decrease and deterioration were true. Some remarkable explanations have now and then been offered.

There are two authentic reports of epidemic mortality among the pickerel due to unknown causes. One explanation was that pickerel had been suddenly frozen to death, but no explanation is offered

why other fish were not affected. A contributor to a sportsman's paper (Maine Woods, 1907) offered a decidedly striking explanation of the decrease of Umbagog Lake pickerel:

> It is a well-known fact that the pickerel that inhabit Umbagog Lake are dying off rapidly. One man who is familiar with the lake advances the theory that they are being killed by hornpouts and this in a very peculiar way. This man says there are millions of hornpouts in Umbagog and that the pickerel devour them. He says: "The horns on the hornpout are always straightened out when the fish is in trouble, and this causes the death of the pickerel"—that they are "hooked to death."

It is doubtful if this hornpout is even a contributory factor in the death of the fish, and certainly there would not be epidemics of "hooking to death." The cause of such epidemics must be sought for by careful study of the fish and prevailing conditions, and even then it may not be revealed.

A gradual decrease in number and size of fish is more easily explained. The habits of the pickerel expose it to more dangers than are incurred by most other kinds of fresh-water fishes. To whatever extent it does or does not sustain its reputation for fierce and gluttonous voracity, those very qualities are its undoing. Whatever may have been its ability to maintain its existence in undisturbed natural conditions before man's attention was directed its way, the ease with which it is caught with any kind of lure, particularly in the winter and spring when congregated in restricted areas, have been decidedly adverse factors. Wholesale ice fishing has hastened its decrease by the destruction of practically every fish in the limited area and those larger fish which would have spawned that spring. Here, too, is the cause of decrease in size. The majority of large fish are caught, few succeed in spawning, and their progeny are in turn caught before they have had time to reach a large size. Consequently, there is a progressive decrease in number and size. While those that succeed in breeding deposit large numbers of eggs, doubtless but few survive. The character of the egg masses and their exposed situation in shallow water subject them to the ravages of other fishes, such as suckers, chubs, perch, etc., as well as reptiles and waterfowl.

A superintendent of one of the Pennsylvania hatcheries wrote that he estimated that fully 10 per cent of eggs deposited are devoured by other fishes before they are hatched and that storms sometimes sweep the eggs from where they are deposited and float them ashore, where they rot. He stated that he had seen hundreds of millions of eggs thus washed ashore and lost. But the reduction does not end there, for the fry from the time it is hatched is the common prey not only of various fishes, including its own kind, but also of reptiles, birds, and other animals. One would not suspect the common, toothless, innocent chub or so-called dace (*Semotilus bullaris*) of being a serious enemy of a fish that has been stated to

be able to take care of itself. Nevertheless, the present writer has observed chubs feeding upon young pickerel and has caught a dozen or so of these fish, of about one-half to 1 pound weight each, and found them gorged with pickerel 2 or 3 inches long. He has also seen a young pickerel chased and driven high and dry on a sand bar by a trout. The pickerel, a fish about 4 inches long, was secured and used as a bait by which the trout, which was about 10 inches long, was caught. The foregoing is sufficient to suggest that if the pickerel is to be saved several things are necessary. Constant increase or maintenance of numbers is possible only when adverse conditions are less or exactly equal to the favorable conditions. Maximum size is attained by any fish only when it is provided with sufficient food and room in which to grow and when it meets no check in its career. In other words, that means when favorable conditions preponderate over unfavorable.

One of the most potent of unfavorable conditions is that of unrestricted fishing. The fish must be protected sufficiently to permit enough to breed to maintain the stock, and the eggs and young should also receive protection so far as possible. It doubtless has become evident that the writer's views regarding the pickerel are more favorable to it than are those of many. Yet he would not advise introducing the fish into waters which contain other desirable fishes, particularly if those waters are small. In fact, he would not recommend it for pond culture at all, owing to the fact that for it to reach the desired perfection in size and quality and in sufficient numbers to make it worth while a large body of water well supplied with natural food is necessary.

It is advised that good natural pickerel waters should be kept in that condition or, if deteriorated, restored to the normal state, for having been naturally favorable for pickerel they are better for that fish than for any other that could be introduced. In order, however, to meet these requirements, the waters must be more than little ponds. They must be good-sized lakes or streams unless the stock is to be kept up by artificial propagation of both the pickerel and its food.

This article would be incomplete without a reference to the alleged usurpation of trout waters by pickerel. The present writer has previously had occasion to comment on this matter. He wrote (1913) that there is scarcely a body of water in which trout once lived and where pickerel now occur that the depletion of the trout has not been ascribed to the pickerel. It undoubtedly eats other fishes, and there are few fishes that do not. But the habits of the pickerel are such that it is not nearly so detrimental to other fish life as some other species held in higher regard, and the pickerel in large bodies of water become still less harmful. It is not much of a wanderer.

It does not rush about in marauding bands seeking what it may devour. It lies in wait and siezes what comes its way when it is inclined to feed, yet often schools of tempting shiners have been seen swimming unharmed in apparently dangerous proximity to big pickerel heads. Again he wrote (1894) that during most of the year it resorts to waters uncongenial to trout, and at all times it prefers such waters. A warm, muddy[a] pond or stream with profuse growth of aquatic vegetation is its favorite abode. Trout can not exist long in such surroundings. In weedy waters where trout manage to exist pickerel will also thrive, but trout will lie in the cooler, clear portions, while pickerel seek the water plants and shallow water. In most instances it would seem that the pickerel is not the whole, though possibly an accessory, cause of the disappearance of trout, and harm done by pickerel is overestimated. The injurious effect of pickerel upon trout and salmon is more often indirect than direct, especially when it appears in congenial waters where trout or salmon are barely maintaining themselves or decreasing. The indirect influence is upon the food supply, and this ultimately reverts upon the pickerel itself. It is an almost invariable rule that in time, after a period of increase in numbers and size, pickerel begin to decrease owing to diminution of the food supply.[b]

Referring to the same subject a number of years ago, after expressing similar sentiments to the foregoing, the writer remarked that excessive and destructive methods of fishing (to which should have been added untimely fishing), pollution of the waters, and the destruction of forests are far more fatal to trout life than their natural enemies.

AS A GAME FISH.

If the pickerel is not on the list of honor as a game fish, it is entitled to the distinction of being an exceedingly good sport fish. As for its game qualities even, in its way, it possesses some characteristics that equal the much-lauded trout. In fact, the writer has more than once found to his surprise that a pickerel was on his hook instead of the expected trout. The actions are much the same. If the tackle consists of the customary long bamboo or stiff wooden pole, stout line, and large hook, and the fish is lifted from the water by main strength, it must be confessed that in this kind of fishing piscatorial poets would find little inspiration. But use a light casting rod, a slender bait rod, or even a fly rod with about the same weight of line as one would employ for trout of like size, and no disappointment will be experienced regarding the gameness of the fish.

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[a] The word "muddy" here does not refer to roily water, but to a muddy bottom, and "warm" is a comparative term meaning warmer than trout waters.

[b] This discussion refers mainly to comparativelys mall lakes or streams into which the pickerel have been introduced.

BANDED PICKEREL (*Esox americanus*).

GEOGRAPHICAL DISTRIBUTION.

This little fish has a somewhat more restricted geographical distribution than the eastern pickerel. Its stated range (Jordan and Evermann, 1896) is from Massachusetts to Florida in lowland streams and swamps. It is found only east of the Allegheny Mountains, the westernmost record being from Escambia River at Flomaton, Ala. It may be added, the northernmost locality from which it has been reported is Lake Bomessen, Vt. (Kendall, 1908). Whether it is indigenous there the writer is not informed.

NAMES.

Bean (1902) said that it is probably identical with the "mackerel pickerel" of Mitchill. Storer (1853) called it the "smaller pickerel," and it is referred to as the troutnose pickerel. Herbert (1849) and others mention it under the name of Long Island pickerel. Smith (1907) cited pike, red-finned pike, and jack as North Carolina names.

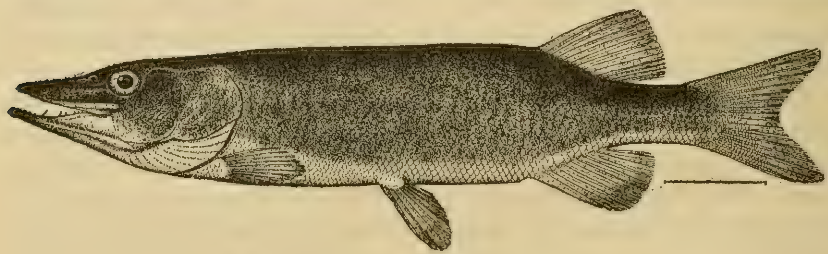

FIG. 5.—BANDED PICKEREL (*Esox americanus*).

SIZES.

Most references state that it rarely exceeds a foot in length or it rarely exceeds a pound in weight. Herbert (1849) said that a pound was greatly above the average weight, which was probably not more than one-half pound.

HABITAT AND HABITS.

Habitat.—The local habitat of this species is in general essentially the same as that of the eastern pickerel. It is found in shallow water amongst water plants, etc.

Bean (1902) said that it is especially plentiful in certain tidal creeks of Long Island, and Eugene Smith reports that it is often found in brackish water in the vicinity of New York, where it is brown in color.

Herbert (1849) described an individual which he stated was caught in a net in the salt water of Newark Bay. He wrote that it weighed something over a pound and a half and that it was in the finest condition. Its color, however, was remarkable, for the back and sides

down to the lateral line were of the richest and most lustrous copper color, paling on the sides into bright brazen yellow, with the belly of a silvery whiteness. The cheeks, gill covers, and fins all partook of the same coppery tone, and the whole fish was far more lucent and metallic than any of the family previously seen by him. There was not the slightest indication of any transverse bars or any mottlings nor was there any of that sea-green color which is so peculiar to the pike family.

Habits.—Its breeding or feeding habits have not been specifically described, but they are probably very similar to those of the eastern pickerel. Smith (1907), writing of the North Carolina fish, stated that its food is chiefly minnows, with which the stomach is often gorged.

FOOD AND GAME QUALITIES.

Bean (1902) wrote that the little banded pickerel is a fish seldom exceeding 10 inches in length, with flaky, white flesh, very few bones, and with delicious flavor, and that it is well worthy of the attention of fish culturists.

Smith (1907) said that in North Carolina it was of less importance as a food and game fish than *Esox reticulatus*.

Storer (1853) wrote that it was not infrequently noticed in Boston market, and that it was so similar to the *reticulatus* that it had previously been considered to be the young of that species.

LITTLE PICKEREL (*Esox vermiculatus*).

GEOGRAPHICAL DISTRIBUTION.

According to Bean (1902), its range is the valleys of the Ohio and Mississippi and streams flowing into the Great Lakes. He stated that Cope mentioned that it is also found in the Susquehanna, of which river it is probably not a native.

Forbes (1908) stated that its general range includes the tributaries of Lake Erie and Lake Michigan, extending thence southward to the Tennessee, Escambia,[a] and White Rivers and, according to Evermann and Cox, to the Neuse River on the Atlantic slope.[a]

It is stated (Evermann and Kendall, 1901 and 1902) to be rather common in all suitable waters of Lake Ontario and is recorded from Black Creek at Scriba Corner; Lake View, West Oswego; Wart Creek near Buena Vista; Great Sodus Bay; outlet of Long Pond near Charlotte; and Marsh Creek near Point Breeze, N. Y.

Cox does not record it from Minnesota, but Tomlin (1892a) wrote: "While fishing in a Minnesota lake one summer evening, I found a

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[a] It is a noticeable coincidence that the Escambia River is given as a locality for both *Esox americanus* and *Esox vermiculatus*, and it is remarkable that it should be recorded from the Neuse River east of the Alleghenies distinctly in the range of *Esox americanus*. These records support the idea advanced by a student of these fishes, to which reference was previously made, to the effect that the two are specifically identical.

school of trout-pickerel * * * common in this lake, and it was a handsome, clean fish."

NAMES.

Forbes (1908) referred to it as little pickerel and grass pike. This latter name appears also in many other publications. It is apparently the common name applied to it in the Pennsylvania Fish Commission's reports. Bean mentioned it also under the name of trout pickerel.

SIZE.

The general statements regarding its size are that it never attains a length of over 12 inches.

HABITAT AND HABITS.

Habitat.—According to Forbes (1908), it has a noticeable preference for quiet and muddy water, and a greater part of his collections

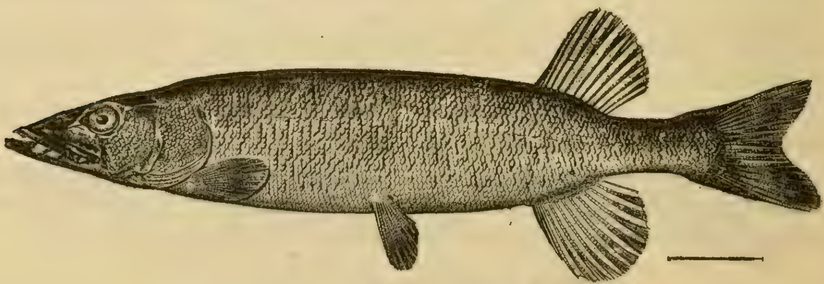

FIG. 6.—LITTLE PICKEREL (*Esox vermiculatus*).

were stated to have come from the weedy branches of the Embarros, Little Wabash, and Big Muddy in eastern and central Illinois. He wrote that it also occurred occasionally in the main stream of the Illinois or in the muddy overflow ponds of the bottoms. Indeed, large numbers of this fish are annually destroyed by the drying up of such ponds after the overflow.

Feeding.—Forbes (1908) stated that the feeding mechanism of this little species is a reduced copy of that of the destructive and voracious common pike, and its food, as illustrated by 18 specimens, seems to be of a purely animal nature. Two of these had eaten frog tadpoles and eight had taken fishes, one of which was a cyprinoid minnow, one a sunfish, and the other a common top minnow (*Gambusia*) of the southern part of the State. The remaining food was mostly composed of the larger aquatic insects. Amphipods and isopod crustaceans have been found in the stomachs of other specimens taken from Quiver Lake, near Havana.

Breeding.—Nothing definite appears to have been published regarding the breeding habits of this species. Forbes (1908) stated that it apparently spawns early and ripe individuals of both sexes had been seen by him in March.

PROPAGATION.

The Pennsylvania Commission (1906) at one of its hatcheries undertook to hatch the eggs of the grass pike, and it was stated that no difficulty was found in taking the eggs but great difficulty was experienced in keeping them from sticking owing to their glutinous character. For some years more or less adult grass pike have been distributed by this commission.

FOOD AND GAME QUALITIES.

A Pennsylvania report (1906) states that it is a valuable fish. It is rather small to figure much as a game fish.

COMMERCIAL FISHERIES FOR THE PIKES.

The various early statistical reports afford but little definite data regarding any of these fishes, owing to confusion of local names and the combination of very different species under the common heading of "pike and pickerel," when very frequently one or the other refers to the pike perch. For this reason no general comparative statistics can be compiled. However, the three larger species have always been of some local commercial value.

Pike.—The U. S. census of 1908 gives four divisions in which "pike and pickerel" figure. The total catch for the United States, according to these figures, was 2,959,000 pounds, valued at $194,000, excluding the Atlantic coast division, which can be regarded as including no pike.

From the other three divisions the figures were as follows, probably composed mostly of pike:

Divisions.	Quantity.	Value.
	Pounds.	
Great Lakes division	2,142,000	$136,000
Mississippi River division	367,000	16,000
Gulf of Mexico division	305,000	11,000
Total	2,814,000	163,000

By States the figures appear as follows:

States.[a]	Quantity.	Value.
	Pounds.	
Illinois	14,000	$1,100
Iowa	61,000	3,200
Michigan	478,000	32,000
Minnesota	351,000	11,000
Missouri	58,000	1,200
New York	90,000	9,600
Ohio	1,118,000	70,000
Tennessee	100	([b])
Texas	305,000	11,000
Wisconsin	317,000	23,000

[a] Other States not distinguished. [b] Less than $100.

In the foregoing list Ohio appears to be the paramount State, yielding nearly 40 per cent of the entire catch of the country, all of which was from Lake Erie waters. In 1899 the recorded catch of pike and pickerel of Ohio in Lake Erie amounted to only 739 pounds, valued at $38, showing the astonishing increase in nine years of over a million pounds, with very little increase in price per pound to fishermen (about 1 cent).

Pickerel.—In the census of 1908 only the Atlantic coast division includes any appreciable quantity of pickerel, unless possibly New York, which has been placed with the other divisions in this discussion upon the assumption that the bulk of the catch was of the Great Lakes fisheries (Lake Erie and Lake Ontario), although some *Esox reticulatus* are doubtless marketed from the St. Lawrence River and some of the smaller lakes.

In New England commercial fisheries for pickerel are permitted only locally, being more or less protected as a sport fish. In 1898 there were 200 pounds recorded for Rhode Island and 5,420 pounds for Connecticut. In 1899 Maine recorded 300 pounds. No statistics are given for later dates except in Connecticut, which in 1902 yielded 8,230 pounds, valued at $530.

The Atlantic division yielded 145,000 pounds, valued at $11,000, most of which probably were *Esox reticulatus*, although some *Esox americanus* may have been included.

By States the catch was recorded as follows:

States.	Quantity.	Value.
	Pounds.	
Delaware	140,000	$1,100
Georgia	1,100	100
Maryland	35,000	3,800
North Carolina	69,000	3,100
Pennsylvania	14,000	1,600
Rhode Island	600	100
Virginia	12,000	1,000

Of the aforementioned States, statistics are available for Delaware and Maryland for the years 1887, 1888, 1901, 1904, and 1908.

The figures are given for pike, which, if they are not intended for pike perch, doubtless indicate pickerel (*Esox reticulatus*) and possibly *Esox americanus*. In these years, also, New Jersey, which in 1908 shows no yield at all, has a comparatively large catch. The following table is given for what it is worth:

Years.	New Jersey.		Delaware.		Maryland.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
1887	27,625	$1,850	26,268	$2,073	521,146	$33,496
1888	30,400	2,066	25,389	2,031	577,745	37,286
1901	2,560	210	16,310	654	67,530	5,390
1904	600	55	11,050	544	42,317	3,716
1908	....	....	14,000	1,100	35,000	3,800

Statistics are also available for North Carolina for the foregoing years, excepting those for 1904 and 1901, the latter being replaced by those of 1902. Also, Virginia and Georgia record small catches for 1901 and 1902, respectively. There may be some doubt regarding the pike of Virginia and North Carolina, as they possibly may comprise some pike perch.

Years.	Virginia.		North Carolina.		Georgia.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
1887			22,402	$1,056		
1888			27,161	1,303		
1901	32,103	$2,848				
1902			30,850	1,487	350	$18
1904	3,644	2,954				
1908	12,000	1,000	69,000	3,100	1,000	100

In the first table a decrease is shown in the catch in each State, New Jersey completely disappearing. In the Southern States the quantity caught appears to have increased considerably. North Carolina gained 46,588 pounds, or over 148 per cent, in the 21 years from 1887, but fell off slightly in price per pound to fishermen.

The foregoing figures, taken with what is known about the pickerel, suggest that it does not breed and grow fast enough to furnish a permanent supply for any extensive or intensive fishery. The first table shows almost progressive decreases in three Middle States in proximity to large markets. While in the South an increase is shown, it is probably ascribable to more extensive and perhaps more intensive fishing in later years. It is safe to predict that unless the fishing is regulated a canvass of the fisheries a few years hence will show a decrease.

Muskellunge.—Owing to its restricted distribution and its importance as a game fish, this fish has never attained to any very considerable commercial fishery. The report of the United States Census of 1908 gives 25,000 pounds, valued at $1, 700, for the Great Lakes division. Michigan furnished 4,000 pounds, New York 19,000 pounds, Wisconsin 1,900 pounds, and Ohio less than 100 pounds. In 1902 New York alone yielded 92,650 pounds, valued at $13,890, of which 85,400 pounds were taken in Lake Chautauqua. In New York these foregoing figures show a falling off of 67,650 pounds in six years.

The question is: Are the pike fisheries worthy of protection and conservation? According to the writer's view, they merit protection as a conservative measure for other so-called "better" fishes and as an economic provision. Consideration of the question will show that such a reason is not so paradoxical as it seems at first sight. The ever-increasing demand by a growing population hastens the decrease

of the fisheries for those species most in popular favor, which, when accompanied by neglect or waste of other edible but less-favored kinds, results in a general depletion, with the result that the more highly esteemed fishes rise in price beyond the purchasing reach of the majority, who are forced to seek cheaper fish food, only to find that there is not enough remaining to supply the demand. This unsatisfied demand affects the price of the so-called inferior fish, and it, in turn or in consequence, also moves upward. The writer is radical enough to believe that there is not an edible fish that swims that should not be conserved. The people of these United States are going to need them sooner or later if they do not already.

It may be added that, as a rule, native species are naturally the easiest to conserve, and indiscriminate stocking of waters with new kinds is not to be recommended. The Biblical injunction about new cloth and old garments or new wine and old bottles is applicable to waters and fishes.

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Appendix VI to the Report of the U. S. Commissioner of Fisheries for 1917

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INTRODUCTION.

The observations and experiments upon which the present paper is based were made in the Beaufort, N. C., region, partly in the laboratory and partly in the field, from April, 1914, to October, 1915. Only living fishes are considered and the experiments in aquaria have probably afforded the most interesting data. While some of the observations here recorded are in general harmony with the published statements of previous investigators, yet they are found to present such essential points of difference as to make it advisable to include them in the present paper. The fact that these and other minnows are now so highly esteemed as agents for the destruction of mosquito larvæ in ponds and reservoirs lends a timely interest to the publication of any data relating to the habits and propagation of the species.

GAMBUSIA AFFINIS (Baird and Girard). THE TOP MINNOW.

NATURAL HISTORY.

This top minnow is known on the Atlantic coast from Delaware to Mexico and in the Mississippi Valley from Illinois to Louisiana. It inhabits both fresh and brackish water, while an occasional straggler is taken in strictly salt water. Locally it is the only viviparous teleost known. It may be found in nearly all shallow streams or ponds of brackish or fresh water, and it is particularly abundant in certain very shallow and muddy arms of the Mullet Pond on Shackleford Bank. Nowhere, however, was it found to grow so large as it does in a small fresh-water pond on Gallants Point. Females taken from this very shallow and extremely dirty pond, visited daily by both cattle and hogs, are from 60 to 65 mm. in length, while the largest specimens obtained elsewhere do not exceed 45 mm. The males, as is well known, are much smaller than the females. The largest male observed in this vicinity was 33 mm. in length, which is probably 6 mm. above the average.

This fish is one of the hardiest known to the writer. It flourishes in very stagnant water, providing, of course, that the proper amount of food is available; it thrives in the aquarium; and it lives equally as well in salt as in fresh water. It may be plunged directly from the one into the other without any apparent harm. If placed in a battery jar and left without change of water it will usually survive until a green scum forms on the walls of the container; thereafter no more attention need be given it, except to add a small quantity of water from time to time to compensate for evaporation. Care must, of course, be exercised not to give the fish more food than it can consume. Probably more aquarium fish of all kinds are lost through overfeeding than from any other cause. Both old and young have been kept in the aquarium at the laboratory for one and one-half years, and were still in good condition at the expiration of that period.

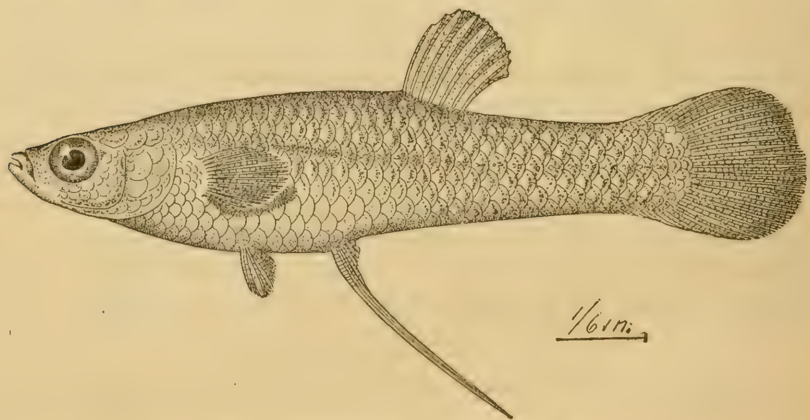

FIG. 1.—*Gambusia affinis.* Top minnow. Male.

Gambusia becomes inactive and ceases to feed even during moderately cool weather. It is at its best in water of a relatively high temperature. The shallow water in which it is usually found in abundance during the summer reaches a temperature, during the day, which is above that of the human body. It is never a very active swimmer, and when it ventures out into water inhabited by larger fishes it becomes an easy prey. Its habit of swimming at or near the surface is well known, and this has caused it to be known everywhere throughout its range as the top minnow. When in very stagnant water it projects its mouth above the surface at frequent intervals, making a sucking noise each time. It is presumed that this is done because there is an insufficient supply of free oxygen in the water, but if this is the case the deficiency of oxygen does not appear to interfere with the health and welfare of the fish. The large size attained by the minnows in the stagnant pond on Gallants Point may be cited as evidence.

OBSERVATIONS ON FEEDING.

The habit of surface swimming in this species is correlated with the fact that it seeks and acquires most of its food at or near the surface of the water. It feeds very largely upon the larvæ of insects when these are available; accordingly, it has been found to be of great value as an eradicator of mosquitoes, and herein lies its greatest economic importance. For this reason, also, it has been planted in many places where it is not native, and the results have been gratifying. While aquarium feeding does not, as a rule, teach us much about a creature's habits of feeding in nature, a few experiments in this connection are nevertheless worthy of mention. An adult female, about 43 mm. in length, had been held in a battery jar since early spring and regularly fed with finely minced fish. On August 2, 1914, she was fed 140 mosquito larvæ between 11 a. m. and 12.15 p. m. The larvæ were all of large size and nearly ready to pupate, being from 6 to 8 mm. in

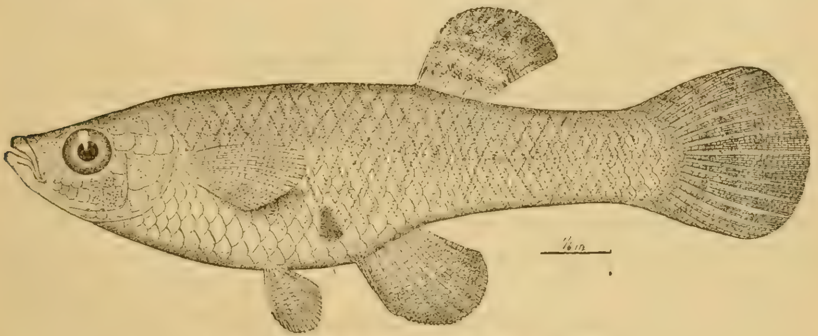

FIG. 2.—*Gambusia affinis*. Top minnow. Female.

length. All except four were eaten by 12.30 p. m. When observation was made again at 5.30 p. m. all the larvæ had been consumed. At 6 p. m. 25 additional larvæ were supplied. Nearly all of these were immediately eaten, and all had disappeared by 9 p. m. It was clear, however, that her appetite was satisfied. The abdominal walls were greatly distended and it was evident that she had eaten all that she could hold.

That its service in the destruction of mosquito larvæ probably begins on the day that the fish is born is evidenced by the fact that fish only a few hours old devoured larvæ that were fed to them. At this early age they were unable to swallow large larvæ, but the writer has seen them swallow larvæ more than half the total length of the fish itself. Considerable difficulty is apparently encountered in swallowing a morsel of this size, and a portion of the larva is often visible 1 minute after the process of swallowing is begun. It was sometimes observed that one such morsel did not satisfy the appetite and that a second one was taken.

While this fish in captivity will readily eat dead food, such as minced fish, oysters, clams, corn bread, the yolk of hard-boiled egg, etc., it shows a preference for living food. Mosquito larvæ were killed and introduced along with live ones, and in each instance no attention was given to the dead larvæ until the live ones had been consumed. It is probable that this fish has a preference for insects as food, but it is evident that it is by no means dependent upon these for subsistence. Apparently it devours nearly anything of suitable size, whether animal or plant. It is well known that in the aquarium *Gambusia* will eat its own young, but this cannibalistic habit is certainly not restricted to aquarium life, since the writer has captured specimens in nature which contained in the stomachs fish of their own kind.

OBSERVATIONS ON BREEDING.

In the Beaufort region this fish delivers its first young of the season some time during May, or in some years possibly as early as the latter part of April, depending largely upon the temperatures which prevail during the early spring. The spring of 1915 was somewhat cooler than the spring of 1914, and the breeding season, therefore, began at least two weeks later. It continues to breed throughout the summer and as late as October.

Copulation, although carefully looked for, was not satisfactorily observed. Apparently it is a very quick process [a] and is accomplished during what appear to be frequent fights in which the opposite sexes engage. That some of these fights are quite real was evidenced by the fact that a female which was confined in a small rectangular jar killed and partly devoured three males that were from time to time introduced for breeding purposes. In order to protect the male from this ferocious female it became necessary to place in the jar a partition of wire netting, with mesh large enough to permit the male to pass through, yet small enough to keep the female back. The male continued to venture out from his compartment quite frequently, and notwithstanding that he was obliged to make many hasty retreats he survived and successfully fertilized the eggs for the future broods.

That a single female may produce as many as six broods of young during a single season was demonstrated through aquarium experiments. In one instance a medium-sized female, about 40 mm. in length, was placed in a small rectangular jar early in the spring of 1914. She gave birth to young as follows: First brood, May 20;

[a] The act of copulation in *Gambusia holbrookii* and *Heterandria formosa* was observed and described by Seal (1911). *Gambusia holbrookii* is now considered a synonym of *G. affinis*. This process was also observed and described by Philippi (1908) in *Glaridichthys januarius* and *G. decemmaculatus*. (The first of these fishes according to Henn (1916) was *Phalloceros caudomaculatus* (Hensel) and the other is placed in the genus *Cnesterodon* Garman by the same author following Eigenmann.)

second brood, July 2; third brood, July 18; fourth brood, August 9; fifth brood, August 30; and sixth brood, October 5. It is probable that some females produce an even greater number of broods during a single season, for it was noted that several females in the aquaria gave birth to young during a period of two to three weeks after the individual just cited had concluded for the season; some also began bearing at an earlier date than this one. Presumably the effect of aquarium life would be to reduce rather than to increase the number of broods. As the temperature of the water seems to determine the time of beginning of the spawning season, it probably influences, to some extent at least, the rapidity with which the later broods are developed. The aquarium in which the above-mentioned female lived was kept in the writer's office, where it was protected from the direct rays of the sun. The water in it, therefore, never reached the luke-warm temperature of that usually occupied by these fish in nature, and for that reason it may be supposed to have exercised a retarding influence upon the development of the successive broods.

The number of young comprising a single brood appears to bear a direct relation to the size of the female. If the female is small, a small brood results. If the female is large, a more numerous brood may be expected. That the earlier broods are larger than the later ones, as suggested by Dr. H. M. Smith (1912, p. 224), could not be verified. A large number of dissections of specimens obtained at various times during the season revealed no differences that would substantiate that suggestion. In the same paper Dr. Smith states that the average number of embryos contained in the ovary of a limited number of fish dissected or observed by him at the aquarium of the Bureau of Fisheries in Washington was 100. Dealing with specimens from the Beaufort region, the largest number found by the present writer in any single ovary was 63, and the average among the largest females obtained did not exceed 40. Dr. Albert Kuntz (1914, p. 183), working with fishes from the Beaufort region, found 76 to be the maximum number produced by a single female. The fish examined by Dr. Smith were from the Potomac River and measured from 45 to 50 mm. in length. They were, therefore, not so large as some of the specimens under observation at Beaufort, the largest of which are 64 mm. in length. The number of broods of one season produced by a single female in a more northern latitude are probably fewer in number, owing to the shorter period of warm weather; but since the observations of Dr. Smith suggest that the broods may be larger, it is possible that the number of young produced during a single season is not materially smaller in the higher latitude.

It is an interesting fact that females separated from males even before the first spring brood is born continue to produce young

throughout the season in a perfectly normal way.[a] A female kept under close observation produced five broods after she had been separated from all other fish. To determine if fish that were separated from males in the spring would continue to produce young the following season without again coming in contact with males, a number of females were kept in aquaria through the winter. In the following spring large eggs, of yellowish appearance, were produced instead of young. Other females that had been with males during the entire summer were separated from them late in the fall and also carried through the winter. This lot, too, produced eggs instead of young. In each case the eggs appeared when young would normally have been produced. These experiments show that this fish is able to carry the sperms throughout the breeding season, but indicate that it can not carry them through the winter.

Ova in various stages of development are present in the ovary at one time. When one brood is born the eggs of the next set are already well developed, being about 1 mm. in diameter, and several smaller eggs are also present. When the fertilization of the different sets of eggs occurs is not known. With regard to *Phalloceros caudomaculatus* and *Cnesterodon decemmaculatus*, two viviparous forms belonging in the same family with *Gambusia affinis* (the family Pœciliidæ), Philippi (1908, p. 22) found that the sexual product of the male consists of numerous milk-white bodies which stick fast to the first available object. Microscopic examination showed that these bodies consist of closely crowded spermatozoa. The whole mass is held together by a sticky substance, which probably causes the sperm bodies to fasten themselves to the genital papillæ of the females. He found also that these bodies were quickly dissolved when they came under the influence of the ovarian fluid, and the individual spermatozoa were set free. Within the folds of the lining of the oviduct the sperms were found in great numbers, even after the birth of young. It is probable that the sperms are retained there throughout the breeding season and that the eggs are fertilized as soon as they are sufficiently mature.

The fact that the female is capable of producing young throughout the breeding season without coming in contact with the male leads one to look with suspicion upon the many notices of "hybrids" produced by crossing species of viviparous fishes. In order to obtain true hybrids of *Gambusia affinis* with another species, if such crossbreeding will occur at all, it would be necessary to begin the experi-

[a] "Zolotnisky (1901, p. 65) observed that a female of *P. caudomaculatus* which had been separated from males after the appearance of a brood of young produced another within six weeks and a third brood four weeks after this. This occurred although copulation subsequent to the first parturition had not taken place. Philippi also isolated females at, or slightly before, parturition. In every instance the females became pregnant for a second time, and one specimen produced a third brood 46 days after the appearance of the second. Poey noted these facts many years ago." (Henn, 1916, p. 102.)

ment during the fall or winter or to rear young for the purpose, in which case the sexes must be segregated at a very early stage.

As the embryos develop within the ovary a black spot appears on each side of the abdomen of the parent above and in front of the vent, and these spots gradually become larger and larger. When they become so large that they are about to meet at the ventral surface, the period of parturition is at hand. The process of extrusion of the young was observed repeatedly. There is no uniformity in the manner of birth. They may appear singly or by twos and threes at a time. Some come head first, some tail first, and others are delivered in a coiled position. Extrusion may occur quickly and with some apparent force; at other times it is a slow and deliberate process. Some females under observation delivered nearly the entire brood in one position, but others did not. It appears that the young are most frequently born tail first and one at a time. The process invariably takes place during the day. The entire brood may be delivered in the course of an hour or two, or the process may consume an entire day or a portion of two days. During this period the adult swims about as usual and eats food when it is supplied. If hungry, she devours her own young as rapidly as they are born. In many instances in the aquarium the mother eats her entire brood on the day they are born.

The young at the time of birth are from 8 to 10 mm. in length. They are very vigorous, and, as previously indicated, they come into the world with an appetite and well prepared to enter upon an independent career. The average rate of growth is rapid, but, as is the case with other forms of animal life, each lot has its "runts." The largest female among a lot born in May, 1914, and reared in the aquarium had reached a length of 25 mm. by the middle of September. The recognizable males were somewhat smaller, although the difference in size was not nearly so great at this age as it is among fish that have attained their full growth. The smallest individuals in this lot were only 13 mm. in length. In the field, by about July 30 it became difficult to distinguish the first young of the season from the adults. The largest specimens taken at this time and identified as young of the season were 25 mm. in length. From this it would appear that the young in natural habitats grow faster than those in captivity. Fish born and reared in the aquarium now nearly one and one-half years old have not quite reached the maximum normal size of their parents.

The external character distinguishing the sexes is the modified anal fin of the adult male, which is developed into an intromittent organ. In the young, however, the anal fins are similar. The modification of this fin in the male is a gradual process and can not be said to become evident at a stated age or length of the fish. In some

specimens the specialized form of the fin becomes evident when the fish is only 13 mm. in length and less than 3 months old; in others it is not apparent at the age of 5 months or at a length of 17 mm. For example, a lot of 43 young born in May, 1914, the smallest of which was 17 mm. in length, was examined on October 15, 1914, and was thought to comprise females only; but on June 3, 1915, 6 of the 39 fish surviving were easily recognized as males. It may, therefore, be stated that the modification of the anal fin into an intromittent organ may take place when the fish reaches a length of 13 mm., or at any later stage until it attains its maximum normal growth of about 25 mm.

The proportion of males to females in this species has been discussed by various writers. In collections the males are generally much in the minority. It has been argued that this is due to the small size of the males, which permits them to pass through the meshes of nets and thus to escape capture. However, when the writer has collected the minnows with mosquito netting of a mesh so small that not even the tiniest male may pass through, the disparity in the numbers of the sexes has remained evident. Among the lots grown in the aquarium, the inequality is quite as great as it seems to be in nature. For example, on June 2, 1915, 60 of the young of the previous season had survived, and of these only 7 were males. The indications are that in the broods of 1915 the sexes are just as unequally represented, although, as shown above, the sexes can not be positively determined at this time (October, 1915). Owing to the rather heavy loss during the early stages of life in the aquarium, the results as stated above may not afford a reliable criterion, although there is no apparent reason why aquarium life should not be as well suited to the male as to the female. Among the adults there is much fighting between the sexes and the males often suffer severely, but among the young these disastrous conflicts have not been observed. It seems entirely probable that the normal ratio of males to females is about 1 to 8 or 9.

The extreme prolificness of the species has already been the subject of comment. It is particularly interesting to know that the early broods of the season reach sexual maturity[a] and some of the fish begin to breed before they are four months old. During both seasons that the young have been observed and grown in the aquarium the oldest and largest females among the broods have delivered their first young during September. At this time the females are only about 23 mm. in length, and the first brood consists of only two or three young. In the fall of 1914 two of the largest females hatched

[a] Seal (1911, p. 95) observed that the young of *Gambusia holbrookii* and *Heterandria formosa* began to breed during the season in which they were born.

in the spring of the same year even succeeded in producing two small broods before the arrival of cool weather.

A female that produced 6 broods during one season, averaging 40 young to a brood, would have 240 descendants of the first generation by the end of the season, assuming that all survived. Now, if the sexes in the first brood occurred in the apparently normal proportion of 5 males and 35 females, and if each female produced three young in September, the total number of young of the second generation resulting from this brood would be 105. It appears that by the end of the season the original female would have given rise to a family of 240 offspring of the first generation and 105 offspring of the second generation. There are few, if any, fishes whose output of eggs does not outnumber the young of *Gambusia*, but the chances of survival for young delivered alive as compared with eggs and young hatched from them, are probably 1,000 to 1. It seems reasonable to conclude, therefore, that under natural and normal conditions no native fish multiplies more rapidly than *Gambusia affinis*.

SUMMARY.

1. *Gambusia affinis* usually inhabits shallow, stagnant waters, whether fresh or brackish, and it thrives under conditions of relatively high temperature if the proper amount of food is available.

2. It is a very hardy fish, adapting itself readily to many different natural conditions as well as to life in the aquarium.

3. Its food consists largely of the larvæ of insects, but it feeds also upon a variety of other animal and plant substances. It sometimes eats its own kind, even its own offspring, especially in the restricted environment of an aquarium.

4. One medium-sized female may destroy as many as 165 large mosquito larvæ in a single day.

5. In the region of Beaufort the fish produces its first brood of young for the season during the month of May and continues to breed throughout the summer until as late as October. It may produce during a single season six or more broods, averaging 40 young to a brood.

6. Females separated from males in the spring shortly before the first brood is born continue to produce young throughout the season. If separated from the male even during late fall no young will result the following spring, but infertile eggs will be deposited.

7. Young are delivered during the day, one, two, or three at a time. Some come head first, some tail first, and others in a coiled position. The period of labor may comprise an hour or the greater portion of a day or even portions of two days.

8. The modified anal fin of the male, which is the external character that distinguishes the sexes, may be fully developed when the fish

is less than 3 months old or not until the fish is 1 year old; it may appear when the fish is 13 mm. in length, or be delayed until a length of 23 mm. is attained.

9. The proportion of males to females appears to be about 1 to 8 or 9.

10. Some of the individuals of the early broods of the season become sexually mature and produce small broods of young late in the season in which they themselves were born.

CYPRINODON VARIEGATUS (Lacépède). THE VARIEGATED MINNOW.

This variegated minnow occurs on the Atlantic coast from Cape Cod to the Rio Grande, inhabiting brackish waters and ascending streams. Stragglers are also taken in strictly salt water. Locally

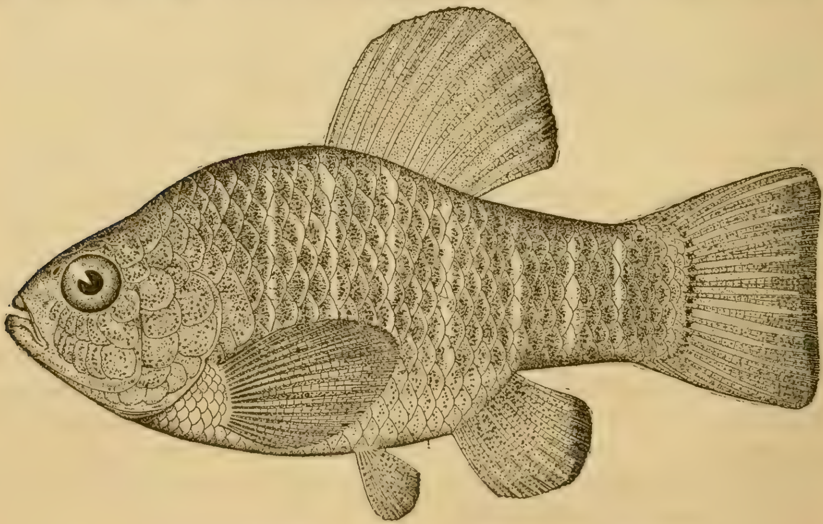

FIG. 3.—*Cyprinodon variegatus.* Variegated minnow. Male.

it is very abundant in the shallow brackish ponds, but it does not appear to attain as large a size as it does in some other localities. The usual length of the adult female is only about 45 mm.; the adult male is somewhat larger, averaging about 48 mm. in length and being notably deeper in body than the female. The sexes appear to occur in equal proportion.

The fish is an active swimmer and very ferocious. In captivity it will kill and devour fishes of other species much larger than itself. Even such species as *Fundulus heteroclitus* (Linnæus) and *Fundulus majalis* (Walbaum), which are ordinarily quite aggressive, are unable to withstand its attacks. Its sharp, tricuspid teeth afford a very effective weapon. It makes its attacks by darts, inflicting a wound here or there, and then quickly turning for defense. After a brief

period another attack is made, and this is kept up until the victim is exhausted or disease attacks the wounds. In several instances it was noticed that a number of individuals made a concerted attack upon one common victim. Where the prey is large and can not be devoured whole, the flesh is ripped from the bones with the sharp teeth and eaten a bit at a time. Cyprinodon does not limit its attacks to fishes of other species. When a number of them are placed in an aquarium, fighting soon ensues among their own kind and cannibalism prevails.

It is apparently a voracious feeder, with a varied diet. In nature it appears to subsist largely upon vegetable matter. The stomachs that were examined were found to be distended with plant stems, algæ, and mud. The nature of the digestive tract, which is much convoluted and equal to about two and one-third times the length of the fish, indicates that plants form the principal natural food.

In 1914 it was noticed that this fish spawned throughout the summer, so that ripe females could be obtained at nearly any time from April, when the observations were begun, until October. It was also found that there were several sizes of eggs present in the ovary at one time. These facts suggested that this fish produced more than one set of eggs during a single season. In order to obtain more definite information in regard to this matter, the following experiments were undertaken: A rectangular box was constructed with four legs and with a hole in the bottom near one end. Beneath the hole there was tacked a piece of wire netting, the meshes of which were too small to permit the escape of the fish to be used in the experiment, but large enough to allow the eggs to pass through, should any be produced. This box was placed in a compartment of a hatching table provided with an overflow and connected with drain pipes. Underneath the hole in the bottom of the box a small basket of wire gauze was placed. The opposite end of the box was somewhat elevated. A small stream of salt water was allowed to flow in at the elevated end, thus creating a current directed toward the opening in the bottom at the opposite end. The purpose of the current was to carry the eggs through the screened opening and cause them to be deposited in the small gauze basket. On April 10 a large female was placed in the box, where she lived until September 20. Eggs were produced on the following dates: April 28, May 28, June 14, daily from June 24 to July 3; July 16, 17, 19, 22, and daily from July 24 to 31; August 9, 11, 13, and 16. The first three sets consisted of from 18 to 24 eggs each and the remainder of only from 2 to 6 each. When the female died on September 20 she was completely "spawned out." It is, however, probable that all of the eggs that were produced did not reach the retaining basket, as dissections indicate that the early sets at least are usually much larger. It is possible that the parent may have eaten

some of them before they reached the wire screen. Several dissections made on April 17 showed that the ovary of a large female contained about 140 well-developed eggs, fully half of which seemed to be of one size and generally nearly mature. To acquire more data on this point, artificial spawning was tried with a number of females. The process of stripping, however, involves more handling than the species endures, and none of the females lived to produce more than two sets of eggs.

Females of this species may be found in spawning condition as early as the middle of March and as late as October 1. Whether the early spawners continue to spawn as late as October or if these late spawners are those that began spawning later in the season is not known. Our aquarium specimen, which was an early spawner, had, under abnormal conditions, spawned out by August 16.

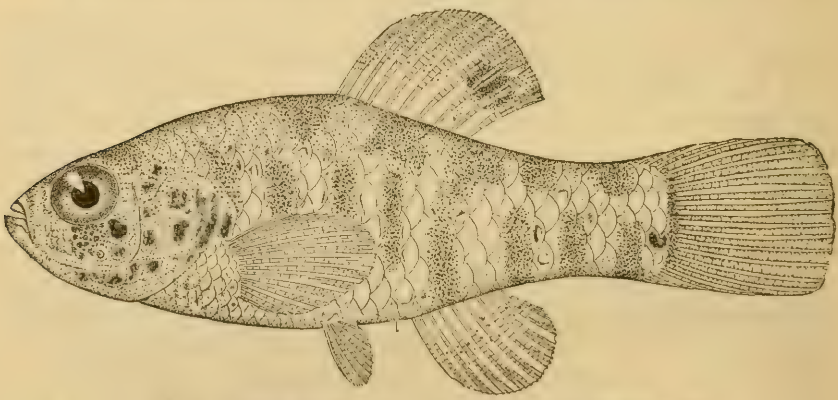

FIG. 4.—*Cyprinodon variegatus.* Variegated minnow. Young.

The eggs of this species are somewhat heavier than salt water. They are spherical in form and about 1 mm. in diameter. Incubation at laboratory temperature occupies five to six days. The newly hatched young are 4 mm. in length (Kuntz, 1916, p. 414). They grow rapidly and by the beginning of August some of the largest are as much as 32 mm. in length. Up to this age the sexes are colored alike and resemble the adult female, but at about this time the young male assumes the adult markings and hereafter it can with difficulty be distinguished from an adult male.

My observations show that this is a very prolific species, and its fecundity may be held to explain in a measure its great abundance. It is said to be of some value as an eradicator of mosquito larvæ, but its greatest economic importance probably lies in the food it furnishes for larger fishes.

In this connection it may be mentioned that observations in the field and dissections made at various times during two seasons strongly

indicate that the following species, common in this vicinity, also produce more than one and perhaps several sets of eggs during a single season: *Lucania parva* (Baird and Girard); *Fundulus heteroclitus* (Linnæus); *Fundulus majalis* (Walbaum); *Fundulus ocellaris* (Jordan and Gilbert); *Fundulus luciæ* (Baird and Girard); *Menidia beryllina* (Cope); and *Menidia menidia* (Linnæus).

SUMMARY.

1. *Cyprinodon variegatus* inhabits shallow, brackish ponds and ascends fresh-water streams. Stragglers occur in strictly salt water.

2. Its principal food consists of vegetable matter, but it probably feeds also on many kinds of animal life. In captivity it is very ferocious and attacks and eats its own kind.

3. In the Beaufort region this fish spawns from March till October, producing eggs at intervals of varying length. Periods of 10 days or a month may intervene between occasions of spawning or eggs may be deposited daily for a considerable period.

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